US006408437B1

(12) **United States Patent**
Hendricks et al.

(10) **Patent No.: US 6,408,437 B1**
(45) **Date of Patent: Jun. 18, 2002**

(54) **REPROGRAMMABLE TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM**

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(73) Assignee: **Discovery Communications, Inc.**, Bethesda, MD (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/906,469**

(22) Filed: **Aug. 5, 1997**

Related U.S. Application Data

(60) Division of application No. 08/160,281, filed on Dec. 2, 1993, now Pat. No. 5,798,785, which is a continuation-in-part of application No. 07/991,074, filed on Dec. 9, 1992.

(51) **Int. Cl.**[7] **H04N 7/173**
(52) **U.S. Cl.** **725/132**; 725/134
(58) **Field of Search** 725/132, 134, 725/140, 152, 131, 139, 142, 151, 9, 14, 16, 32, 35, 34, 36, 45, 46; H04N 7/16, 7/173

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,891,792	A	6/1975	Kimura	
4,361,848	A	11/1982	Poignet et al.	
4,381,522	A	4/1983	Lambert	
4,398,216	A	8/1983	Field et al.	
4,488,179	A	12/1984	Kruger et al.	
4,517,598	A	5/1985	Van Valkenburg et al.	
4,528,643	A	7/1985	Freeny, Jr.	
4,558,464	A	* 12/1985	O'Brien, Jr.	455/2
4,587,520	A	5/1986	Astle	
4,605,964	A	8/1986	Chard	
4,621,282	A	11/1986	Ahern	

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

CA	2055574	12/1992
DE	3423846	1/1986
EP	103438	3/1984

(List continued on next page.)

OTHER PUBLICATIONS

Sorce et al., *Human Factors in Telecommunications*, Sep. 10–14, 1990/.

HP–41C Operationg Manual, Hewlett Packard Co., Dec., 1982.

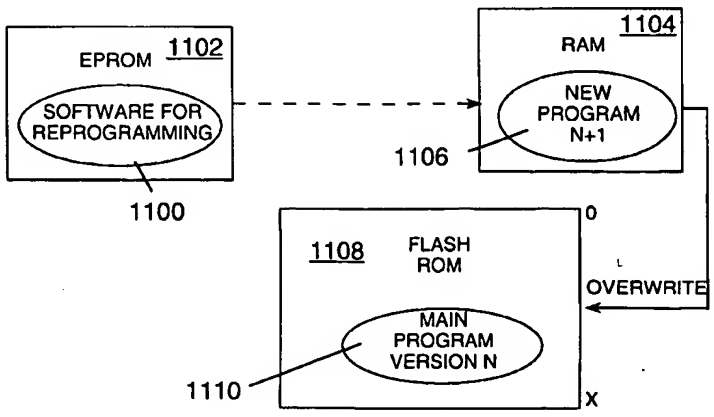
(List continued on next page.)

Primary Examiner—Chris Grant
(74) *Attorney, Agent, or Firm*—Dorsey & Whitney LLP

(57) **ABSTRACT**

A novel reprogrammable set top terminal for a television program delivery system which suggests programs for viewing is described. The invention relates to methods and apparatus for reprogramming set top terminals, and selecting and displaying programs to suggest to subscribers for viewing. The invention is particularly useful in television program delivery systems with hundreds of channels of programming, a menu driven program selection system, and a program control information signal which carries data and identifies the available program choices. Specifically, the invention relates to remote reprogramming of terminal memory and the gathering and analysis of data for selecting programs to suggest to a subscriber. The invention is a terminal which includes a means for receiving incoming signals, a processor, memory, and a means to generate menu screens for display on a TV or monitor. Various data gathering and analysis techniques are used to customize selection of programs for display on a menu.

55 Claims, 24 Drawing Sheets



U.S. PATENT DOCUMENTS

4,633,462	A		12/1986	Stifle et al.
4,639,225	A		1/1987	Washizuka
4,688,218	A		8/1987	Blineau et al.
4,694,490	A		9/1987	Harvey et al.
4,697,209	A		9/1987	Kiewit et al.
4,706,121	A		11/1987	Young
4,712,130	A		12/1987	Casey
4,724,491	A		2/1988	Lambert
4,792,972	A		12/1988	Cook, Jr.
4,805,014	A		2/1989	Sahara et al.
D301,037	S		5/1989	Matsuda
4,829,558	A		5/1989	Welsh
4,829,569	A		5/1989	Seth-Smith et al.
4,860,379	A		8/1989	Schoeneberget et al.
4,876,736	A		10/1989	Kiewit
4,928,168	A		5/1990	Iwashita
4,947,429	A		8/1990	Bestler et al.
4,949,187	A		8/1990	Cohen
4,959,810	A		9/1990	Darbee et al.
4,961,109	A		10/1990	Tanaka
4,965,825	A		10/1990	Harvey et al.
4,975,951	A		12/1990	Bennett
4,977,455	A		12/1990	Young
D314,383	S		2/1991	Hafner
4,995,078	A		2/1991	Monslow et al.
5,001,554	A		3/1991	Johnson et al.
5,014,125	A		5/1991	Pocock et al.
5,015,829	A		5/1991	Eilert et al.
5,020,129	A		5/1991	Martin et al.
5,027,400	A		6/1991	Baji et al.
5,036,394	A		7/1991	Morii et al.
5,036,537	A		7/1991	Jeffers et al.
5,038,402	A		8/1991	Robbins
5,046,093	A		9/1991	Wachob
5,047,867	A		9/1991	Strubbe et al.
5,056,138	A		10/1991	Tyson, Sr.
5,073,930	A		12/1991	Green et al.
5,075,771	A		12/1991	Hashimoto
5,078,019	A		1/1992	Aoki
5,093,718	A		3/1992	Hoarty et al.
D325,581	S		4/1992	Schwartz
5,103,314	A		4/1992	Keenan
5,105,268	A		4/1992	Yamanouchi et al.
5,132,789	A		7/1992	Ammon et al.
5,132,992	A		7/1992	Yurt et al.
5,133,079	A		7/1992	Ballantyne et al.
D329,238	S		9/1992	Grasso et al.
5,144,663	A		9/1992	Kudelski et al.
5,150,118	A		9/1992	Finkle et al.
5,151,782	A		9/1992	Ferraro
5,151,789	A		9/1992	Young
5,155,591	A		10/1992	Wachob
5,166,886	A		11/1992	Molnar et al.
D331,760	S		12/1992	Renk, Jr.
5,172,413	A		12/1992	Bradley et al.
5,182,639	A		1/1993	Jutamulia et al.
5,202,817	A		4/1993	Koenck et al.
5,206,954	A		4/1993	Inoue et al.
5,216,515	A		6/1993	Steele et al.
5,223,924	A		6/1993	Strubbe
5,237,311	A		8/1993	Mailey et al.
5,237,610	A		8/1993	Gammie et al.
5,247,347	A		9/1993	Letteral et al.
5,253,066	A		10/1993	Vogel
5,253,275	A		10/1993	Yurt et al.
5,253,341	A		10/1993	Rozmanith et al.
5,260,778	A		11/1993	Kauffman et al.
5,282,028	A		1/1994	Johnson et al.
5,283,639	A		2/1994	Esch et al.
5,285,272	A		2/1994	Bradley et al.
5,289,271	A		2/1994	Watson
5,293,540	A		3/1994	Trani et al.
5,293,633	A		3/1994	Robbins
5,319,455	A		6/1994	Hoarty et al.
5,319,707	A		6/1994	Wasilewski et al.
5,323,240	A		6/1994	Amano et al.
5,327,554	A		7/1994	Palazzi, III et al.
5,339,315	A		8/1994	Maeda et al.
5,341,474	A		8/1994	Gelman et al.
5,343,239	A		8/1994	Lappington et al.
5,343,516	A		8/1994	Callele et al.
5,345,594	A		9/1994	Tsuda
5,349,638	A		9/1994	Pitroda et al.
5,351,075	A		9/1994	Herz et al.
5,353,121	A		10/1994	Young et al.
5,355,162	A		10/1994	Yazolino et al.
5,357,276	A		10/1994	Banker et al.
5,365,265	A		11/1994	Shibata et al.
5,367,571	A		11/1994	Bowen et al.
5,375,068	A		12/1994	Palmer et al.
5,390,348	A		2/1995	Magin et al.
5,396,546	A		3/1995	Remillard
5,400,401	A		3/1995	Wasilewski et al.
5,404,393	A		4/1995	Remillard
5,404,505	A		4/1995	Levinson
5,410,326	A		4/1995	Goldstein
5,410,344	A		4/1995	Graves et al.
5,412,416	A		5/1995	Nemirofsky
5,414,426	A		5/1995	O'Donnell et al.
5,416,508	A		5/1995	Sakuma et al.
5,424,770	A		6/1995	Schmelzer et al.
5,432,542	A		7/1995	Thibadeau et al.
5,440,632	A		8/1995	Bacon et al.
5,442,626	A		8/1995	Wei
5,446,919	A		8/1995	Wilkins
5,461,667	A		10/1995	Remillard
5,469,206	A		11/1995	Strubbe et al.
5,473,362	A		12/1995	Fitzgerald et al.
5,477,263	A		12/1995	O'Callaghan et al.
5,479,268	A		12/1995	Young et al.
5,481,294	A		1/1996	Thomas et al.
5,481,296	A		1/1996	Cragun et al.
5,481,542	A		1/1996	Logston et al.
5,483,278	A		1/1996	Strubbe et al.
5,497,187	A	*	3/1996	Banker et al. 348/7
5,500,794	A		3/1996	Fujita et al.
5,515,098	A		5/1996	Carles
5,561,708	A		10/1996	Remillard
5,561,709	A		10/1996	Remillard
5,570,126	A		10/1996	Blahut et al.
5,644,354	A		7/1997	Thompson et al.
5,661,516	A		8/1997	Carles
5,663,757	A		9/1997	Morales et al.
5,696,906	A		12/1997	Peters et al.
5,724,091	A		3/1998	Freeman et al.
5,758,257	A	*	5/1998	Herz et al. 348/7

FOREIGN PATENT DOCUMENTS

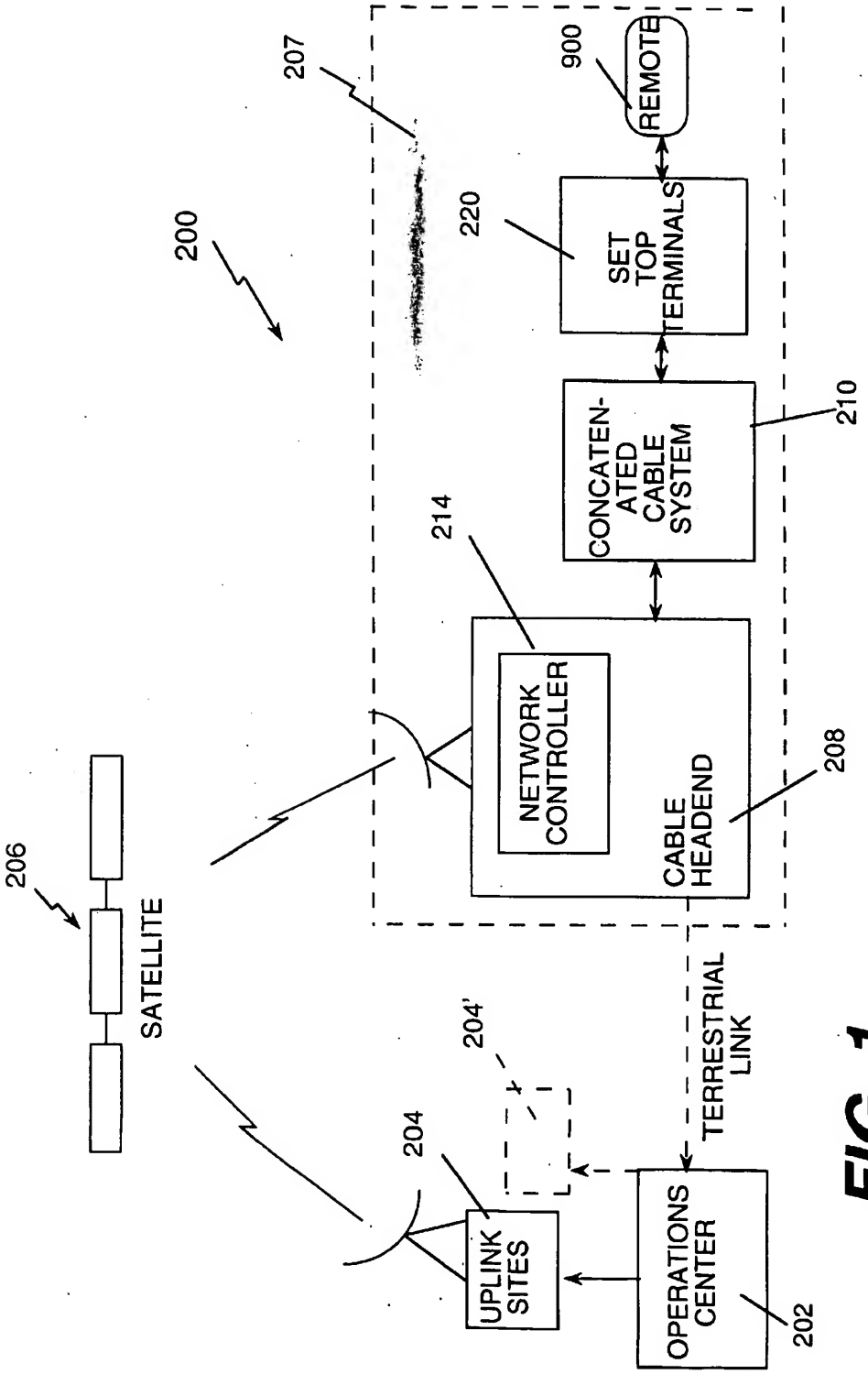
EP	145063	6/1985
EP	149536	7/1985
EP	158548	10/1985
EP	167237	1/1986
EP	243312	10/1987
EP	2810 293	9/1988
EP	328440	8/1989
EP	0 355 697	2/1990
EP	399200	11/1990
EP	0 402 809	12/1990
EP	0 424 648	5/1991
EP	450841	10/1991
EP	0 506 435	9/1992

EP	513553	11/1992
EP	570785	11/1993
GB	1204190	9/1970
GB	2168227	6/1986
GB	2177873	1/1987
JP	61060150	3/1986
JP	62-140134	6/1987
JP	62-245167	3/1989
JP	1-130683	5/1989
JP	01-142918	6/1989
JP	5250106	9/1993
TW	234223	11/1994
TW	235358	12/1994
TW	235359	12/1994
TW	236065	12/1994
TW	236744	12/1994
WO	86/01962	3/1986
WO	89/09528	10/1989
WO	91/00670	1/1991
WO	91/03112	3/1991
WO	92/11713	7/1992
WO	92/12599	7/1992
WO	92/17027	10/1992
WO	92/21206	11/1992
WO	93/22877	11/1993

OTHER PUBLICATIONS

Reimer; *Memories In My Pocket*; Feb. 1991.
Advertisement; *Hong Kong Enterprise*; Nov. 1988.
Advertisement; *Great Presentation*; 1987.
Advertisement; *Consumer Dist.*; Fall/Winter 1992.
van den Boom; *Interactive Videotex . . .* ; Nov./Dec. 1986.
Moloney; *Digital Compression in Todays . . .* ; Jun. 6, 1993.
Bestler; *Flexible Data Structures . . .* ; Jun. 6, 1993.
Gelman et al.; *A Store–and–Forward . . .* ; Jun. 21, 1991.
Sharpless; *Subscription teletext for value added services*; Aug. 1985.

* cited by examiner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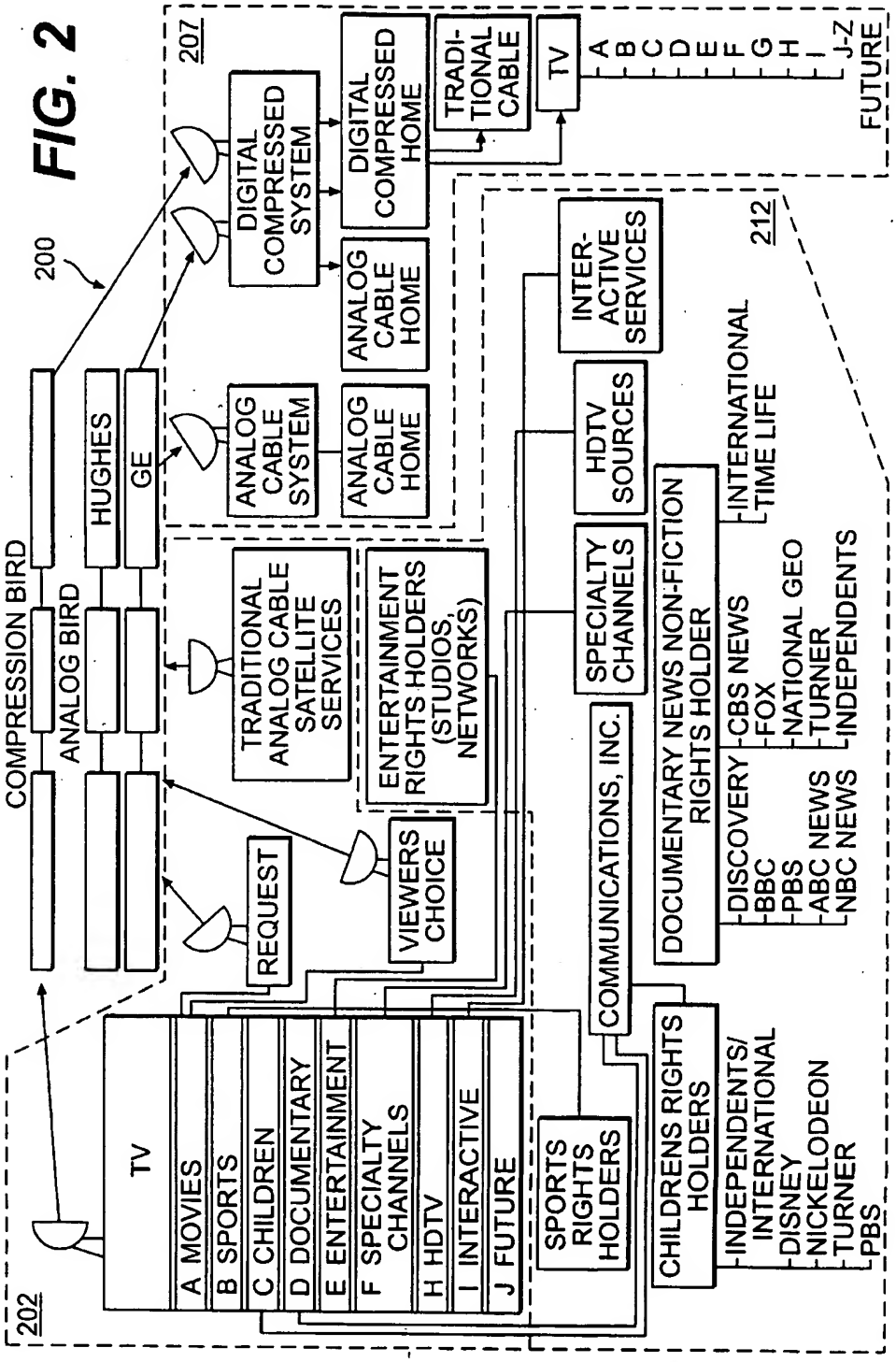
207
900
REMOTE
220
SET TOP TERMINALS
CONCATEN-ATED CABLE SYSTEM
210
214
NETWORK CONTROLLER
CABLE HEADEND
208
206
SATELLITE
204'
204
TERRESTRIAL LINK
UPLINK SITES
OPERATIONS CENTER
202

FIG. 1

FIG. 2


200
COMPRESSION BIRD
ANALOG BIRD
HUGHES
GE
207
DIGITAL COMPRESSED SYSTEM
ANALOG CABLE SYSTEM
ANALOG CABLE HOME
ANALOG CABLE HOME
DIGITAL COMPRESSED HOME
TRADI-TIONAL CABLE
TV
A
B
C
D
E
F
G
H
I
J-Z
FUTURE
INTER-ACTIVE SERVICES
212
HDTV SOURCES
SPECIALTY CHANNELS
INTERNATIONAL TIME LIFE
DOCUMENTARY NEWS NON-FICTION RIGHTS HOLDER
CBS NEWS
FOX
NATIONAL GEO
TURNER
INDEPENDENTS
DISCOVERY
BBC
PBS
ABC NEWS
NBC NEWS
TRADITIONAL ANALOG CABLE SATELLITE SERVICES
ENTERTAINMENT RIGHTS HOLDERS (STUDIOS, NETWORKS)
VIEWERS CHOICE
REQUEST
COMMUNICATIONS, INC.
SPORTS RIGHTS HOLDERS
CHILDRENS RIGHTS HOLDERS
INDEPENDENTS/ INTERNATIONAL
DISNEY
NICKELODEON
TURNER
PBS
202
TV
A MOVIES
B SPORTS
C CHILDREN
D DOCUMENTARY
E ENTERTAINMENT
F SPECIALTY CHANNELS
H HDTV
I INTERACTIVE
J FUTURE

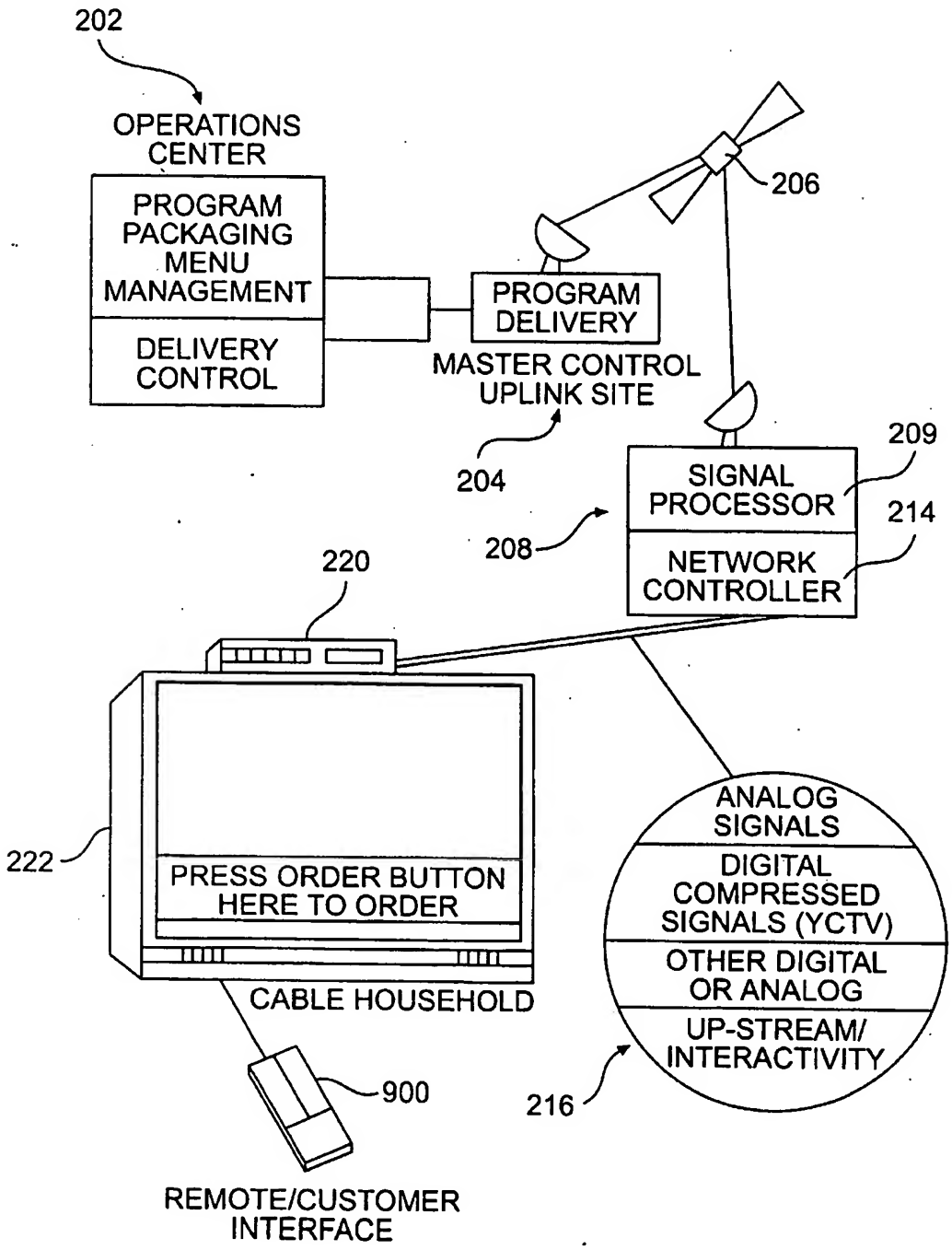

202
OPERATIONS CENTER
PROGRAM PACKAGING MENU MANAGEMENT
DELIVERY CONTROL
PROGRAM DELIVERY
206
MASTER CONTROL UPLINK SITE
204
209
SIGNAL PROCESSOR
214
208
NETWORK CONTROLLER
220
222
PRESS ORDER BUTTON HERE TO ORDER
CABLE HOUSEHOLD
ANALOG SIGNALS
DIGITAL COMPRESSED SIGNALS (YCTV)
OTHER DIGITAL OR ANALOG
UP-STREAM/ INTERACTIVITY
216
900
REMOTE/CUSTOMER INTERFACE

FIG. 3

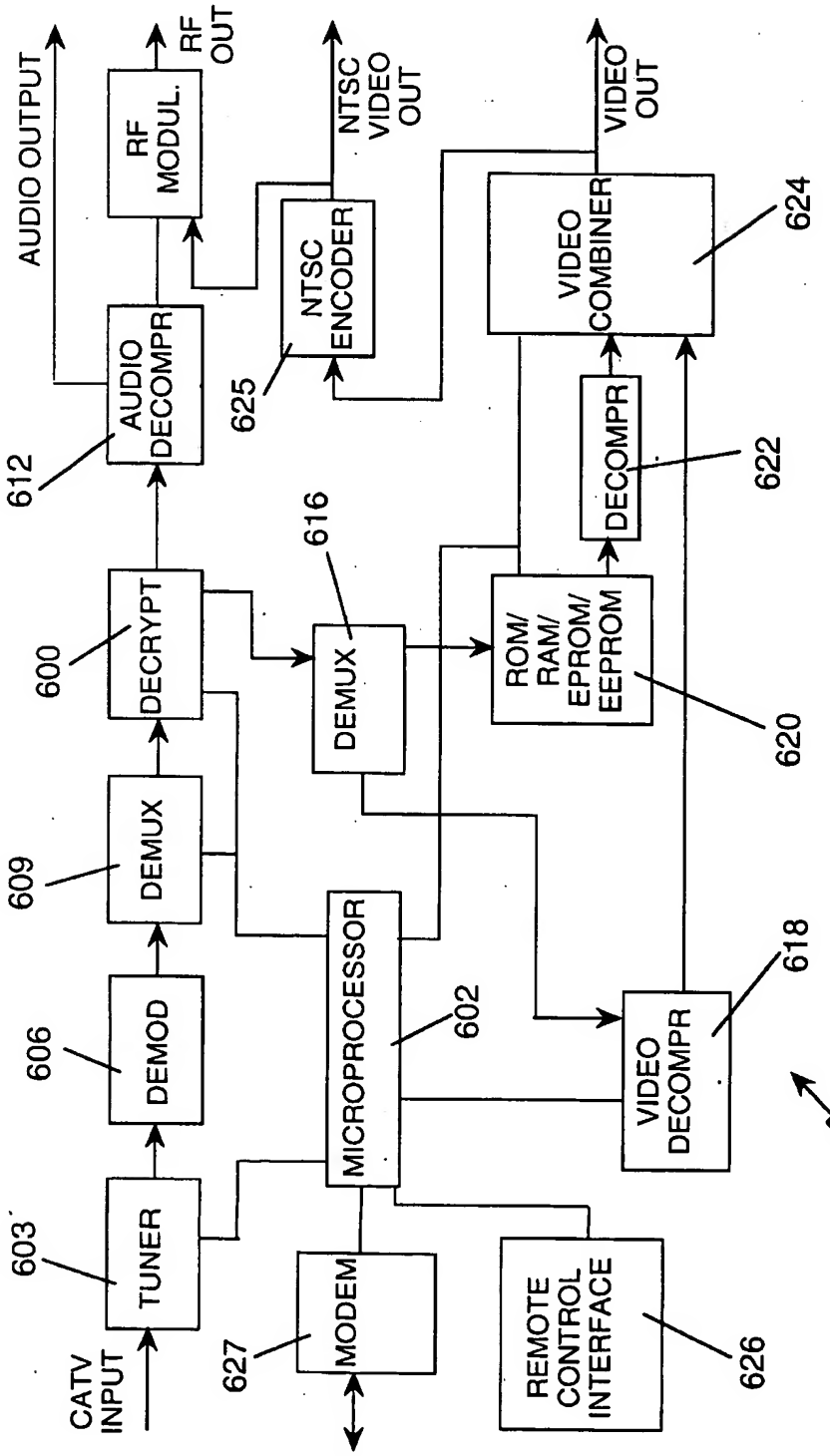

CATV INPUT
TUNER
603
DEMOD
606
DEMUX
609
DECRYPT
600
AUDIO DECOMPR
612
AUDIO OUTPUT
RF MODUL.
RF OUT
NTSC ENCODER
625
NTSC VIDEO OUT
MODEM
627
MICROPROCESSOR
602
DEMUX
616
ROM/ RAM/ EPROM/ EEPROM
620
DECOMPR
622
VIDEO COMBINER
624
VIDEO OUT
VIDEO DECOMPR
618
REMOTE CONTROL INTERFACE
626
220

FIG. 4

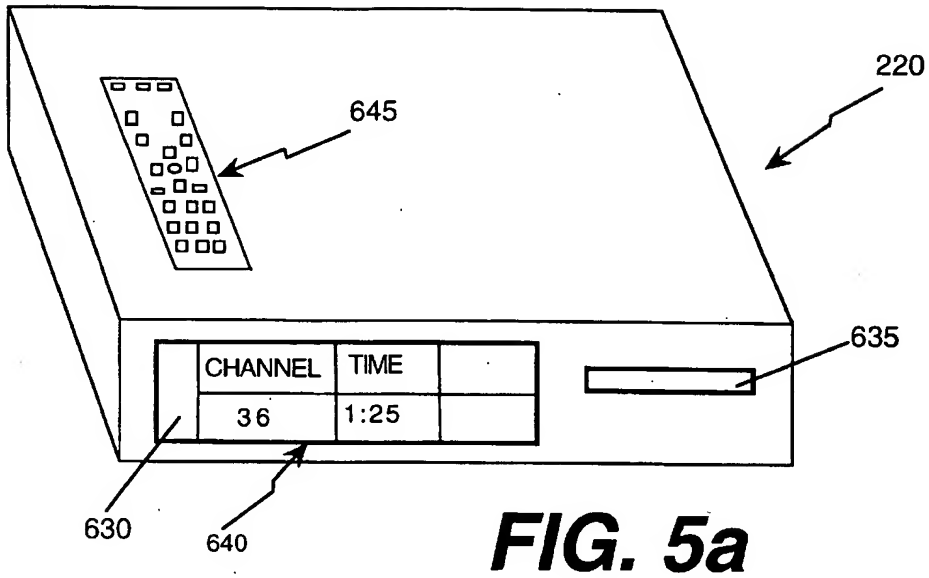

220
645
635
CHANNEL
TIME
36
1:25
630
640

FIG. 5a

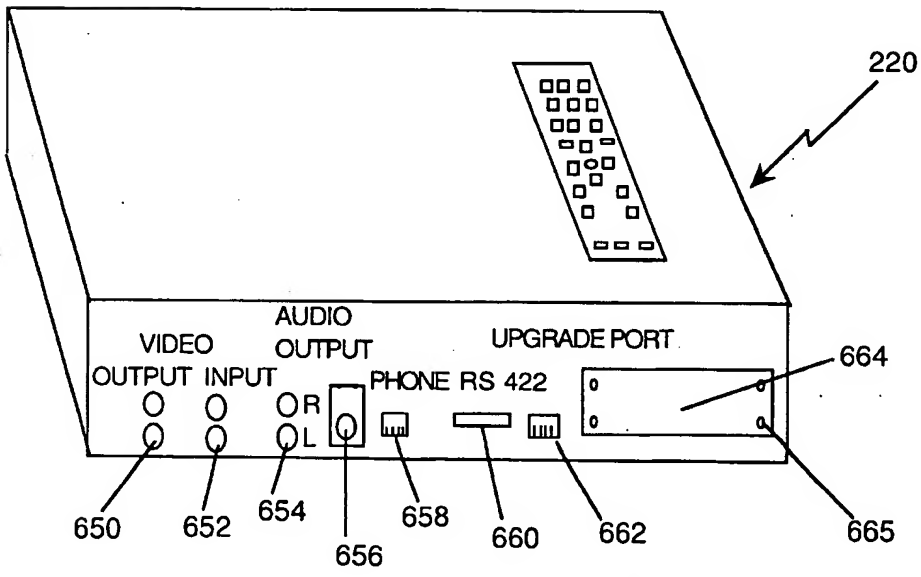

220
AUDIO
VIDEO
OUTPUT
UPGRADE PORT
OUTPUT INPUT
PHONE RS 422
R
L
664
650
652
654
656
658
660
662
665

FIG. 5b

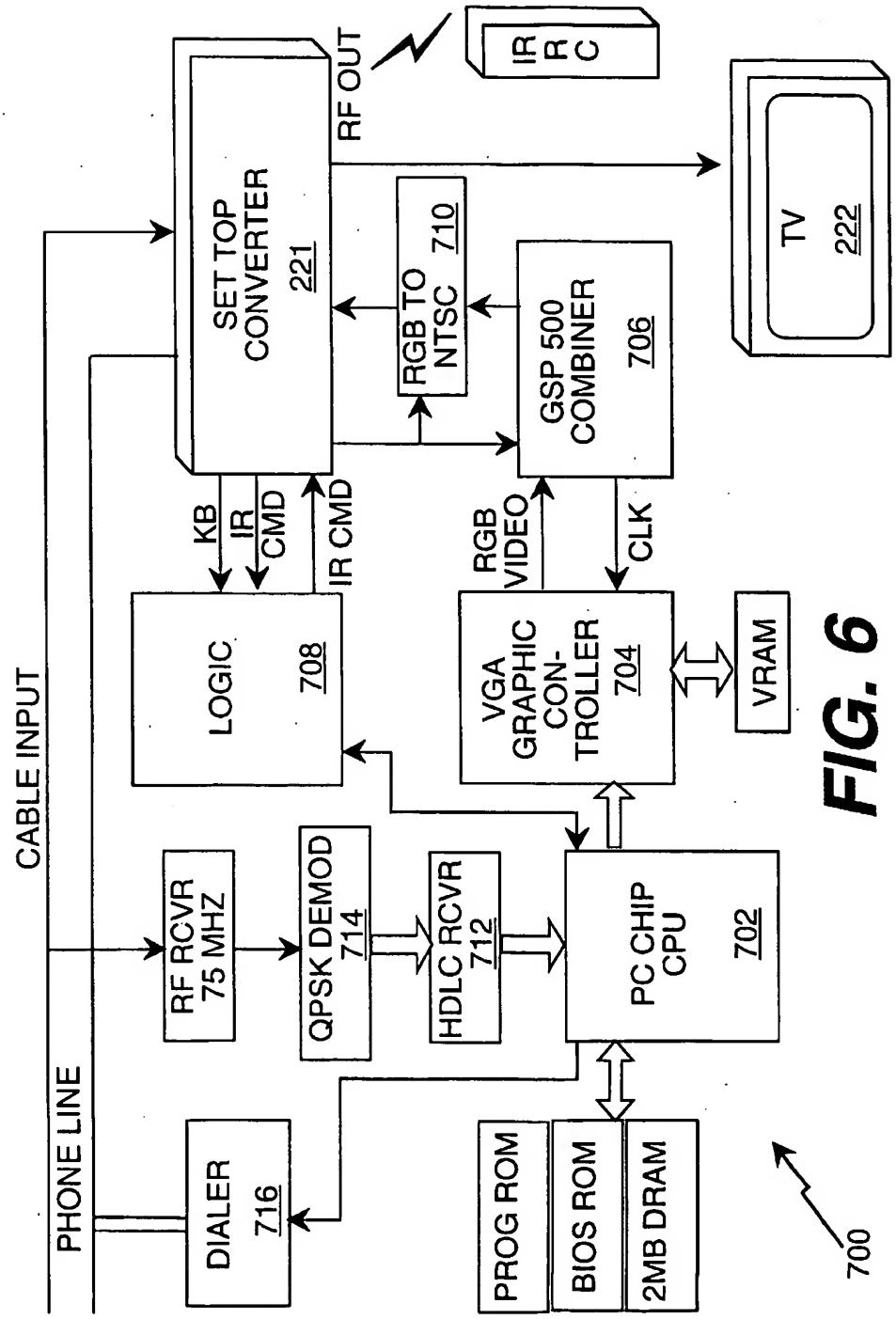

IR R C
RF OUT
SET TOP CONVERTER 221
TV 222
RGB TO NTSC 710
GSP 500 COMBINER 706
KB
IR CMD
IR CMD
RGB VIDEO
CLK
LOGIC 708
VGA GRAPHIC CON-TROLLER 704
VRAM
CABLE INPUT
RF RCVR 75 MHZ
QPSK DEMOD 714
HDLC RCVR 712
PC CHIP CPU 702
PHONE LINE
DIALER 716
PROG ROM
BIOS ROM
2MB DRAM
700

FIG. 6

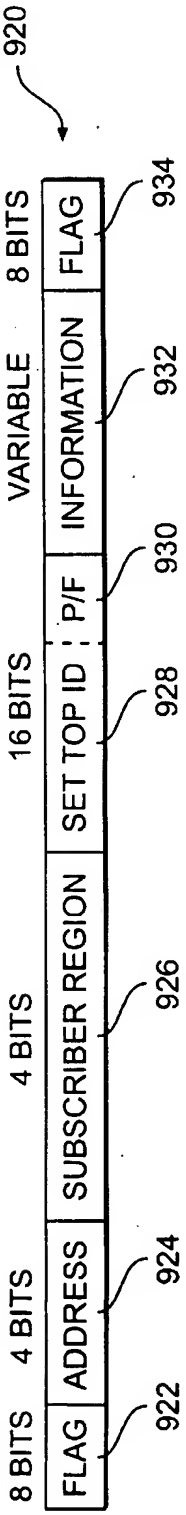

920
8 BITS
4 BITS
4 BITS
16 BITS
VARIABLE
8 BITS
FLAG
ADDRESS
SUBSCRIBER REGION
SET TOP ID
P/F
INFORMATION
FLAG
922
924
926
928
930
932
934

FIG. 7a

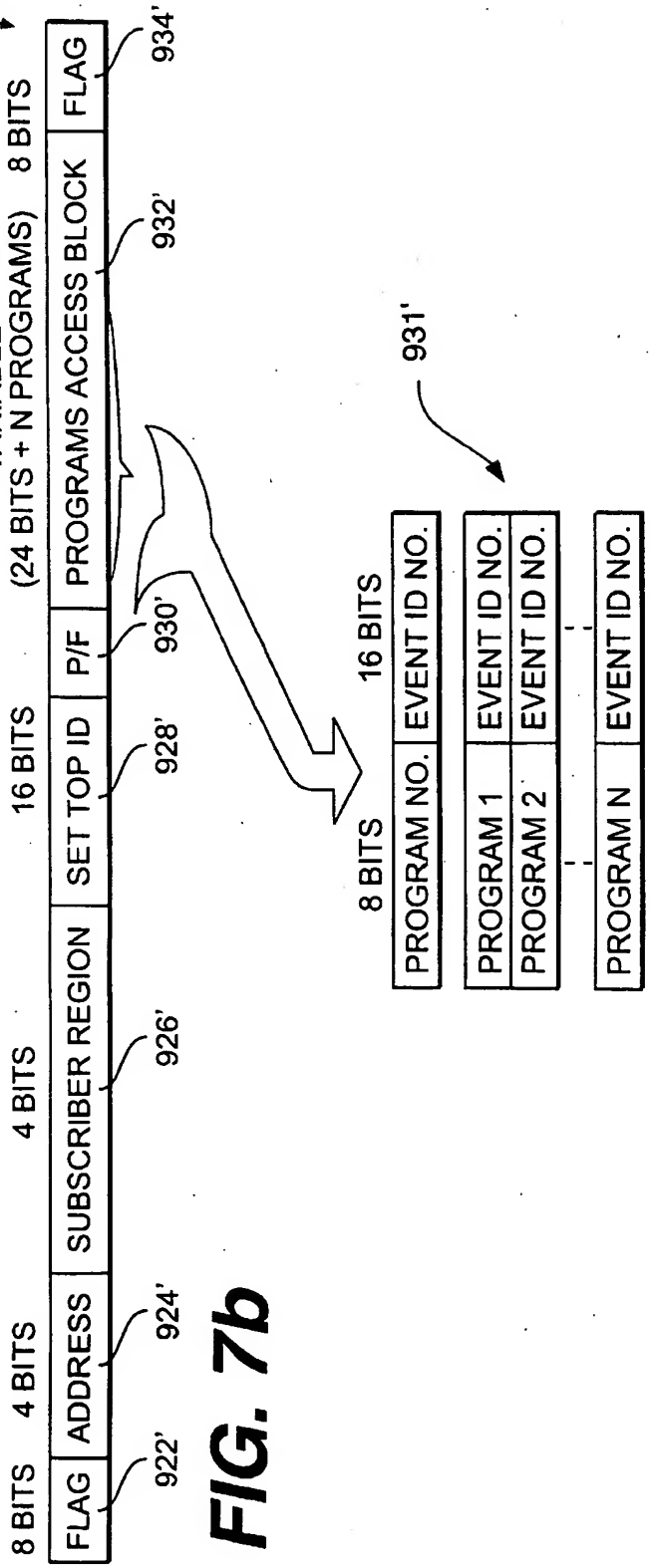

920'
8 BITS
4 BITS
4 BITS
16 BITS
VARIABLE
(24 BITS + N PROGRAMS)
8 BITS
FLAG
ADDRESS
SUBSCRIBER REGION
SET TOP ID
P/F
PROGRAMS ACCESS BLOCK
FLAG
922'
924'
926'
928'
930'
932'
934'
931'
8 BITS
16 BITS
PROGRAM NO.
EVENT ID NO.
PROGRAM 1
PROGRAM 2
PROGRAM N
EVENT ID NO.
EVENT ID NO.
EVENT ID NO.

FIG. 7b

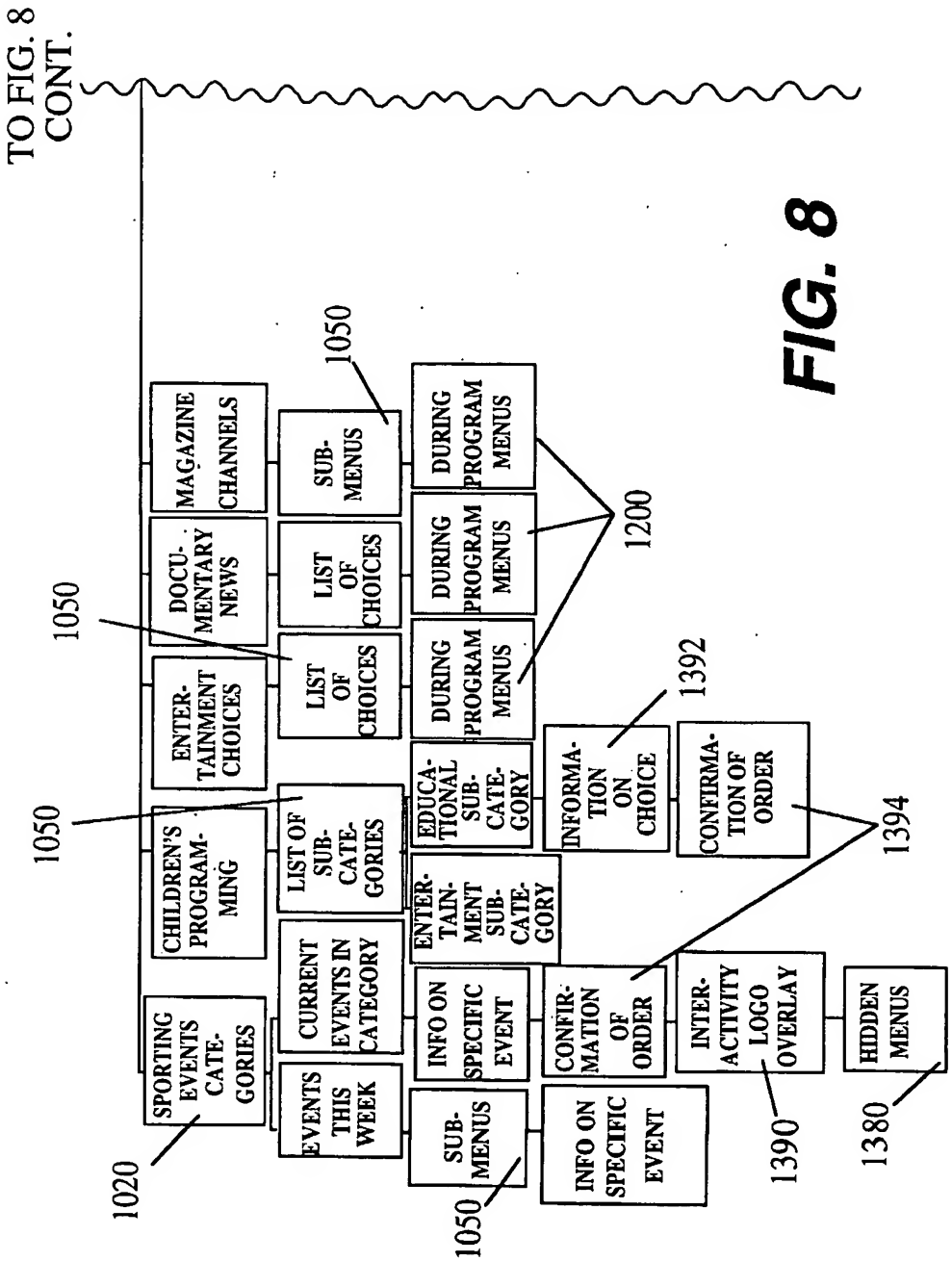
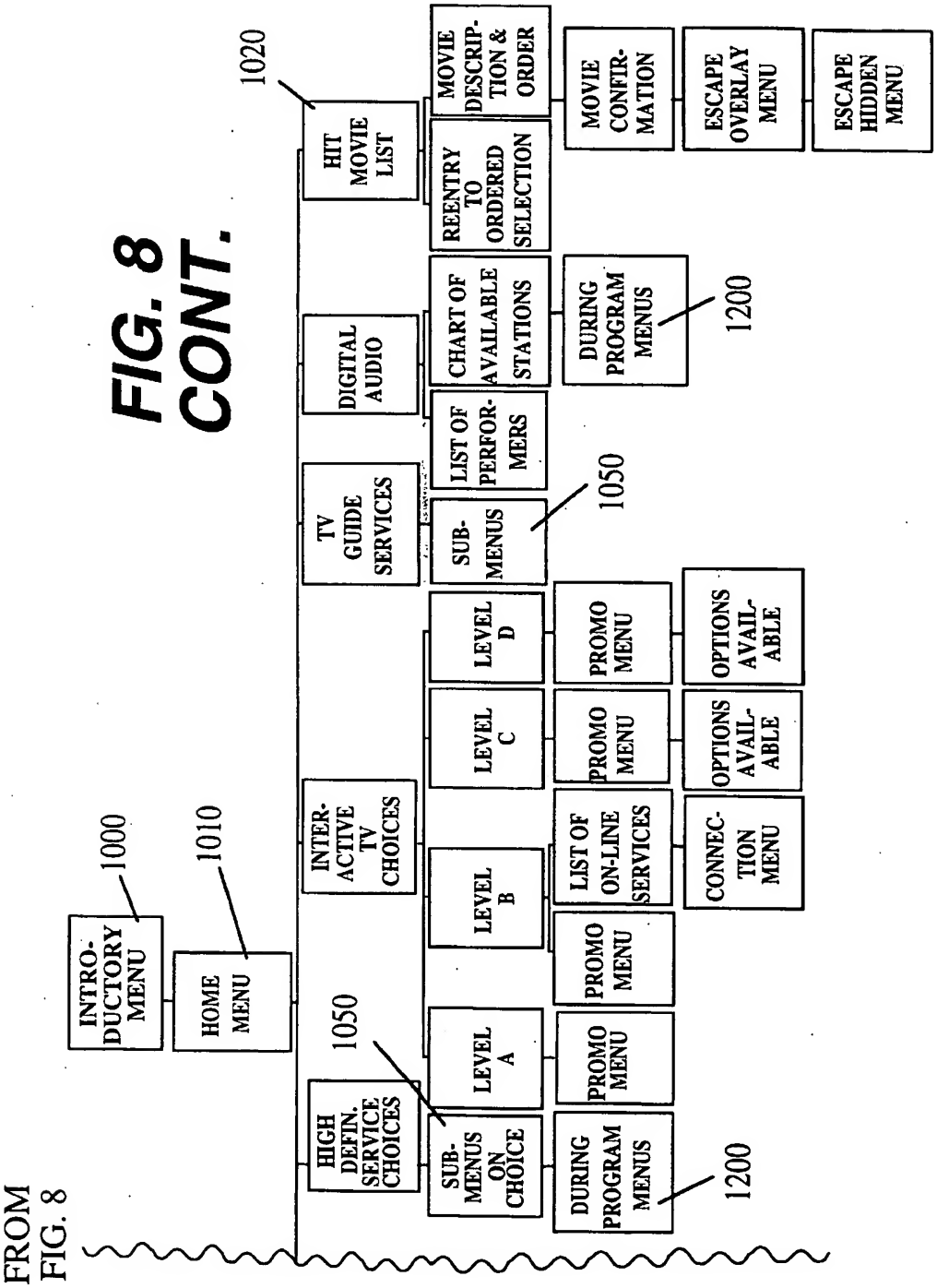
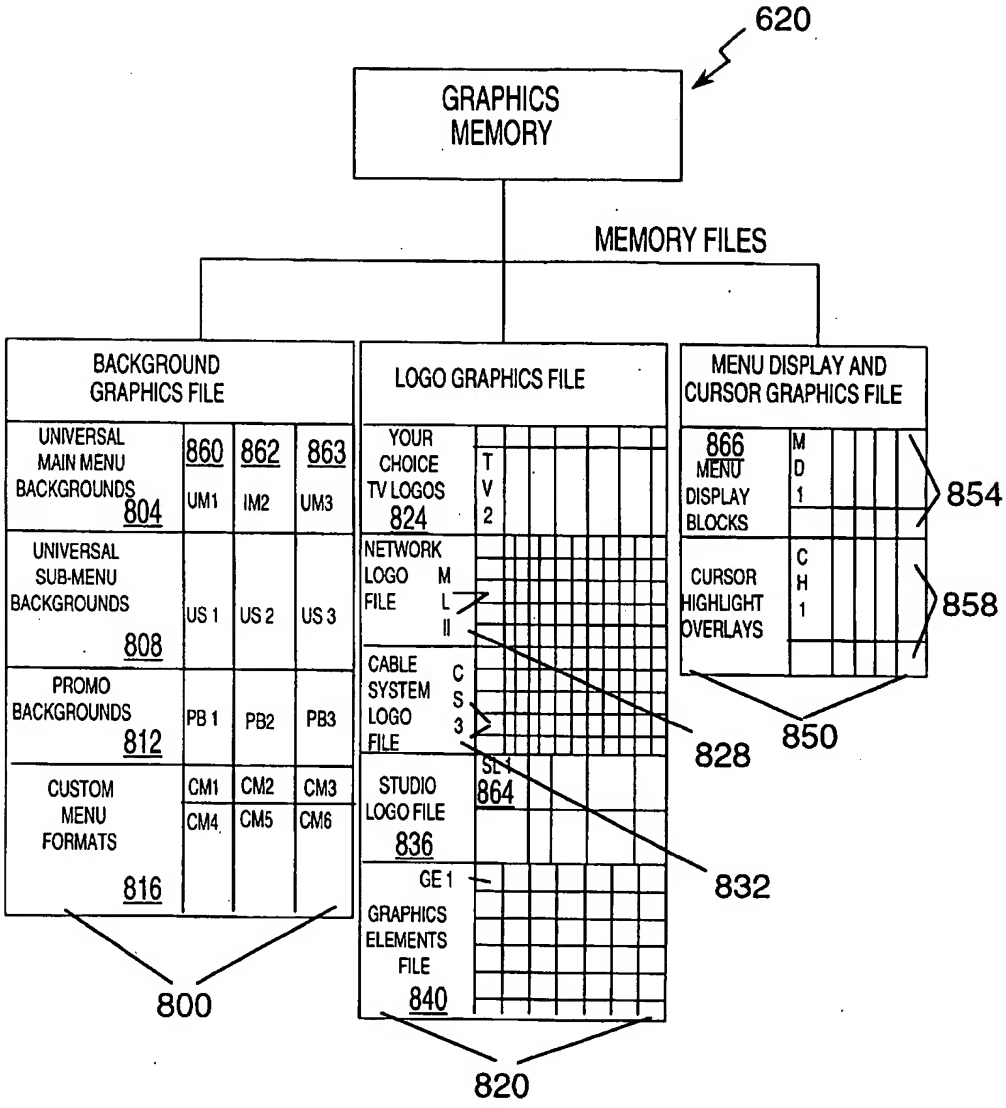

TO FIG. 8 CONT.
1020
SPORTING EVENTS CATE-GORIES
EVENTS THIS WEEK
SUB-MENUS
1050
CHILDREN'S PROGRAM-MING
CURRENT EVENTS IN CATEGORY
INFO ON SPECIFIC EVENT
INFO ON SPECIFIC EVENT
1050
ENTER-TAINMENT CHOICES
LIST OF SUB-CATE-GORIES
ENTER-TAIN-MENT SUB-CATE-GORY
EDUCA-TIONAL SUB-CATE-GORY
1050
DOCU-MENTARY NEWS
LIST OF CHOICES
DURING PROGRAM MENUS
INFORMA-TION ON CHOICE
1392
MAGAZINE CHANNELS
SUB-MENUS
1050
DURING PROGRAM MENUS
DURING PROGRAM MENUS
DURING PROGRAM MENUS
1200
CONFIRMA-TION OF ORDER
1394
CONFIR-MATION OF ORDER
INTER-ACTIVITY LOGO OVERLAY
1390
HIDDEN MENUS
1380

FIG. 8

FIG. 8 CONT.


FROM FIG. 8
INTRO-DUCTORY MENU
1000
HOME MENU
1010
INTER-ACTIVE TV CHOICES
HIGH DEFIN. SERVICE CHOICES
1050
SUB-MENUS ON CHOICE
LEVEL A
PROMO MENU
DURING PROGRAM MENUS
1200
LEVEL B
PROMO MENU
LIST OF ON-LINE SERVICES
CONNEC-TION MENU
LEVEL C
PROMO MENU
OPTIONS AVAIL-ABLE
LEVEL D
PROMO MENU
OPTIONS AVAIL-ABLE
TV GUIDE SERVICES
SUB-MENUS
1050
LIST OF PERFOR-MERS
DIGITAL AUDIO
CHART OF AVAILABLE STATIONS
DURING PROGRAM MENUS
1200
HIT MOVIE LIST
1020
REENTRY TO ORDERED SELECTION
MOVIE DESCRIP-TION & ORDER
MOVIE CONFIR-MATION
ESCAPE OVERLAY MENU
ESCAPE HIDDEN MENU


620
GRAPHICS MEMORY
MEMORY FILES
BACKGROUND GRAPHICS FILE
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860 UM1
862 IM2
863 UM3
UNIVERSAL SUB-MENU BACKGROUNDS 808
US 1
US 2
US 3
PROMO BACKGROUNDS 812
PB 1
PB2
PB3
CUSTOM MENU FORMATS 816
CM1
CM2
CM3
CM4
CM5
CM6
800
LOGO GRAPHICS FILE
YOUR CHOICE TV LOGOS 824
TV2
NETWORK LOGO FILE
ML
CABLE SYSTEM LOGO FILE
CS3
828
SL1
STUDIO LOGO FILE 836
864
832
GE1
GRAPHICS ELEMENTS FILE 840
820
MENU DISPLAY AND CURSOR GRAPHICS FILE
866 MENU DISPLAY BLOCKS
MD1
854
CURSOR HIGHLIGHT OVERLAYS
CH1
858
850

FIG. 9a

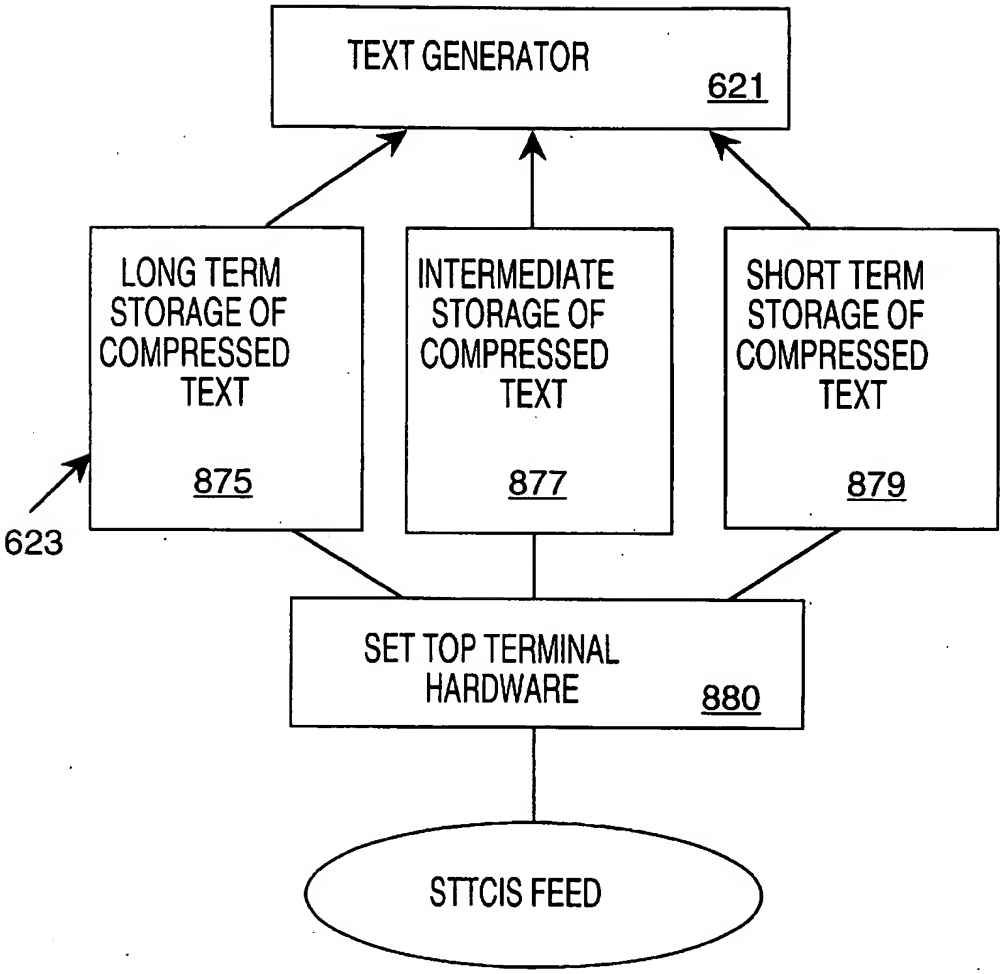

TEXT GENERATOR
621
LONG TERM STORAGE OF COMPRESSED TEXT
875
INTERMEDIATE STORAGE OF COMPRESSED TEXT
877
SHORT TERM STORAGE OF COMPRESSED TEXT
879
623
SET TOP TERMINAL HARDWARE
880
STTCIS FEED

FIG. 9b

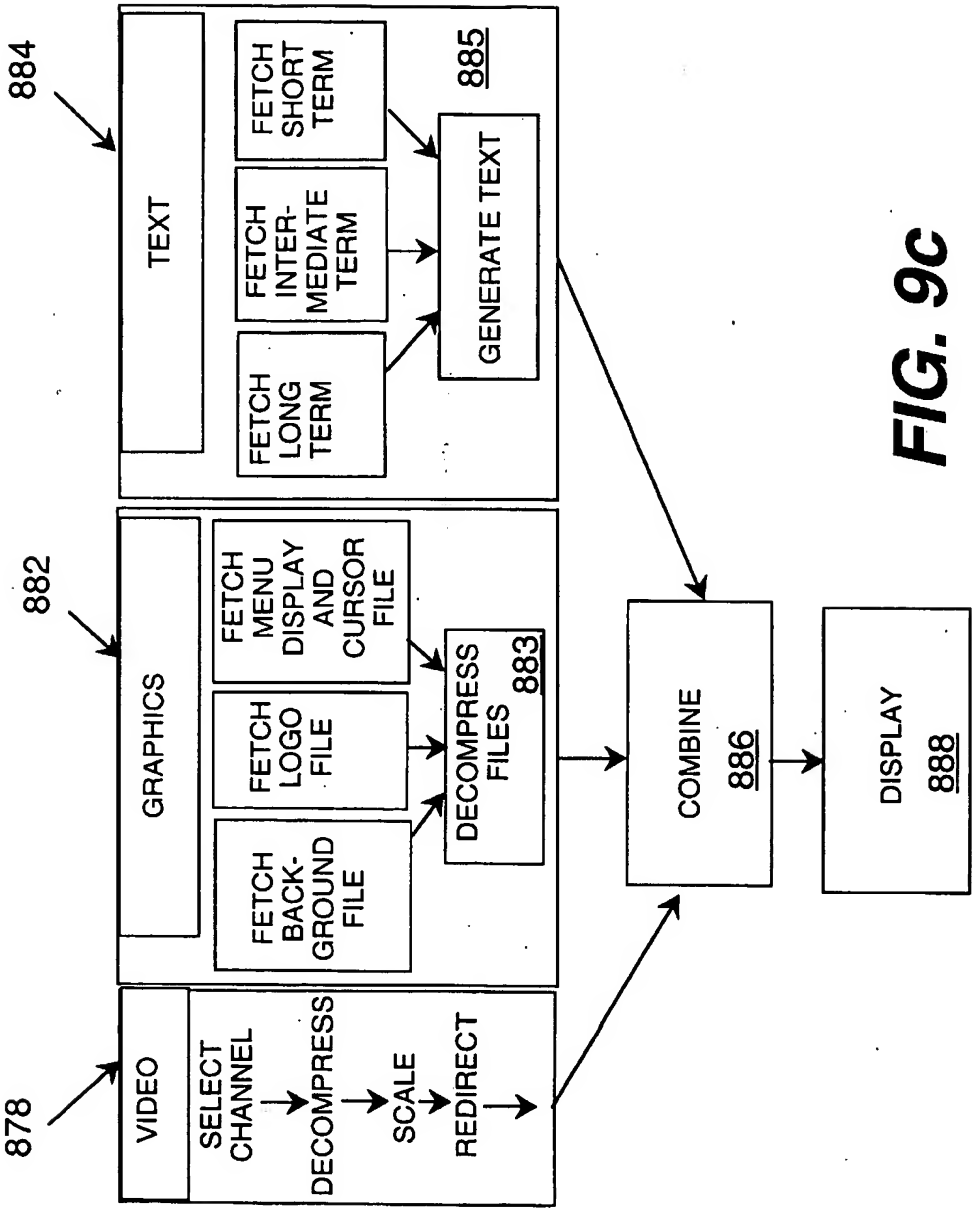

878
VIDEO
SELECT CHANNEL
DECOMPRESS
SCALE
REDIRECT
882
GRAPHICS
FETCH BACK-GROUND FILE
FETCH LOGO FILE
FETCH MENU DISPLAY AND CURSOR FILE
DECOMPRESS FILES 883
884
TEXT
FETCH LONG TERM
FETCH INTER-MEDIATE TERM
FETCH SHORT TERM
885
GENERATE TEXT
COMBINE 886
DISPLAY 888

FIG. 9c

FIG. 10a

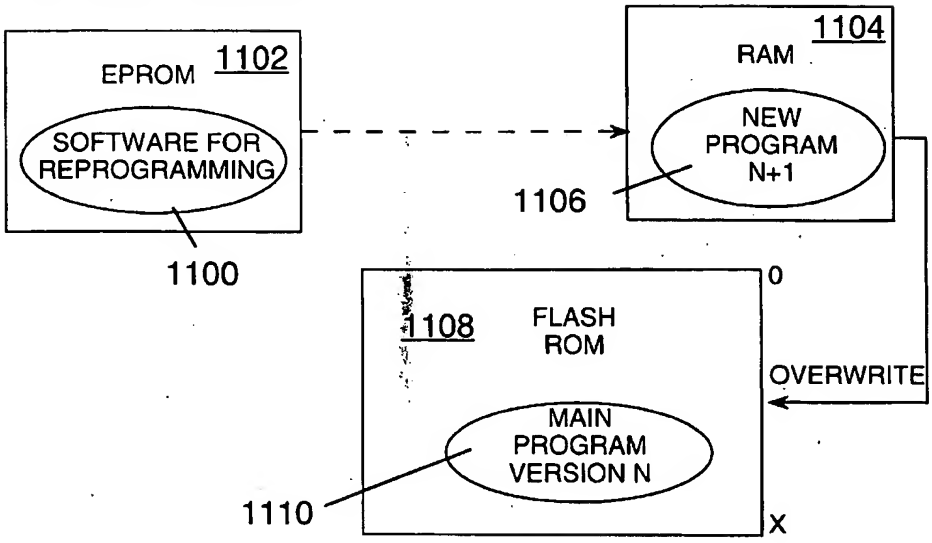
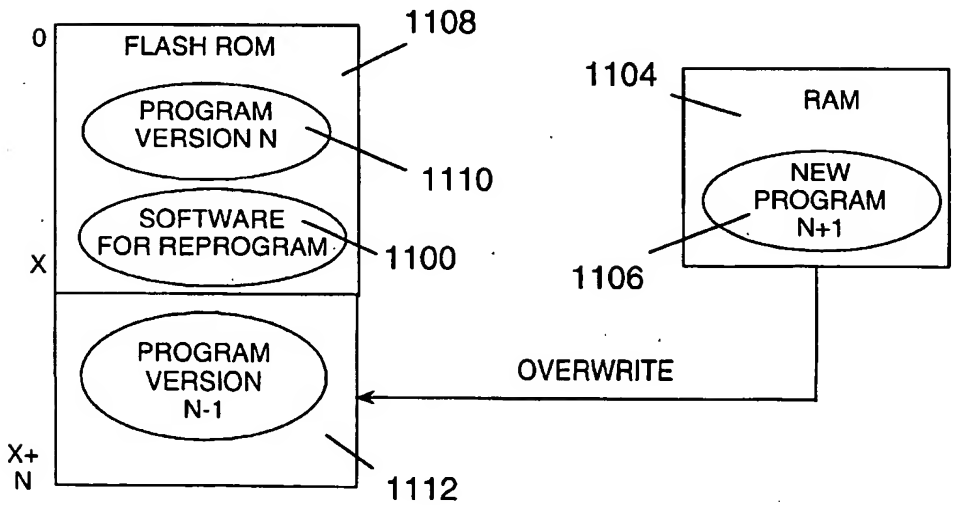


FIG. 10b



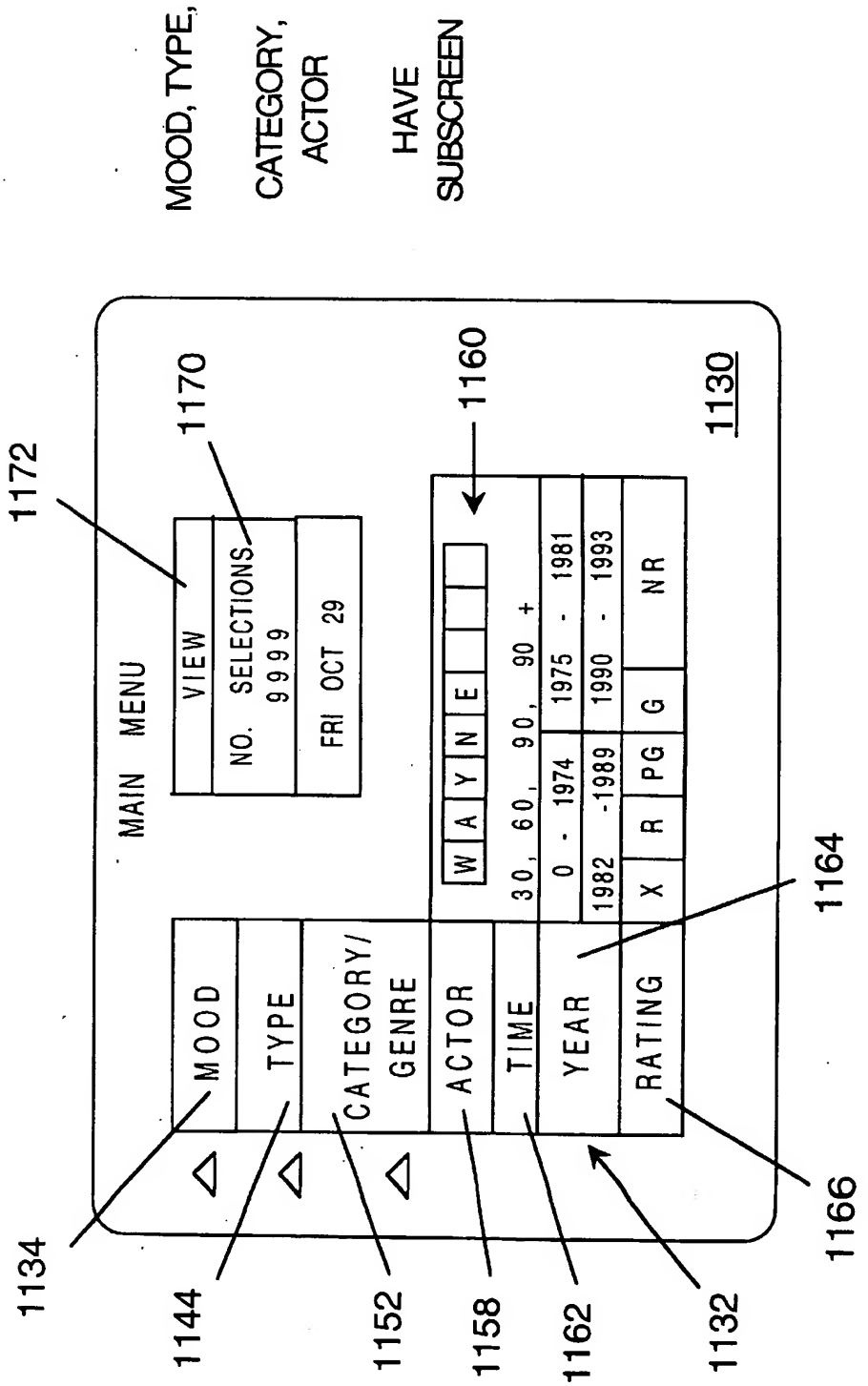

MOOD, TYPE,
CATEGORY,
ACTOR
HAVE
SUBSCREEN
MAIN MENU
VIEW
NO. SELECTIONS
9999
FRI OCT 29
MOOD
TYPE
CATEGORY/
GENRE
ACTOR
TIME
YEAR
RATING
W A Y N E
30, 60, 90, 90 +
0 - 1974
1975 - 1981
1982 -1989
1990 - 1993
X
R
PG
G
NR
1130
1132
1134
1144
1152
1158
1160
1162
1164
1166
1170
1172

Fig. 11a

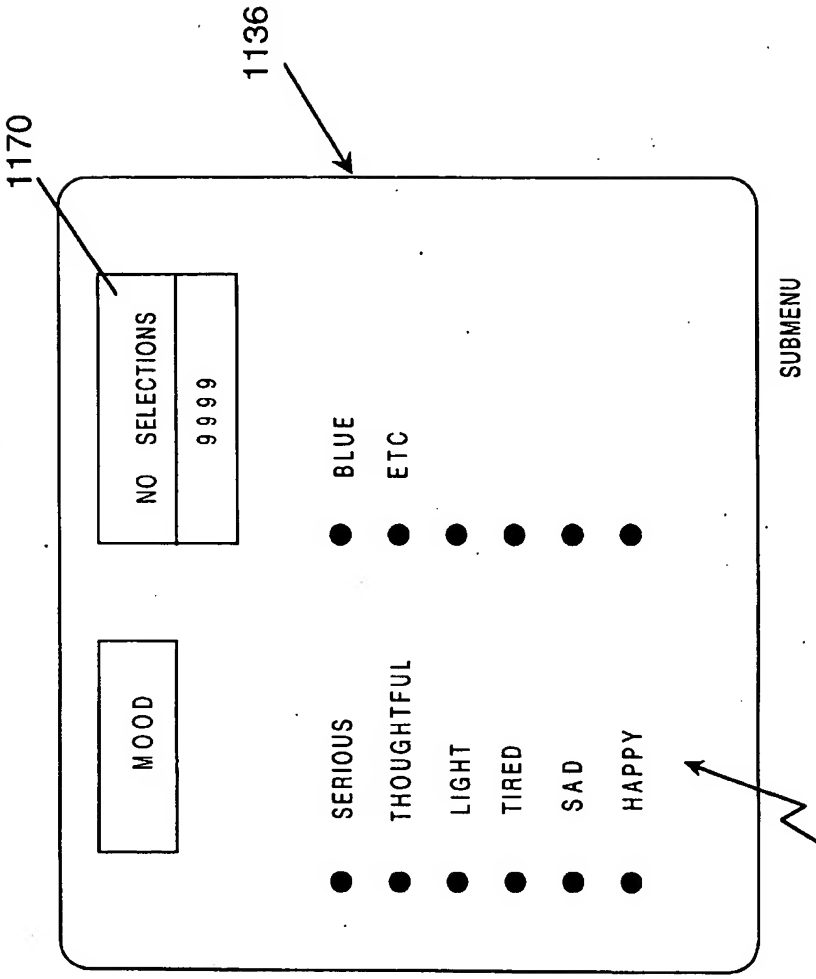

1136
1170
NO SELECTIONS
9999
MOOD
BLUE
ETC
SERIOUS
THOUGHTFUL
LIGHT
TIRED
SAD
HAPPY
SUBMENU
1138

FIG. 11b

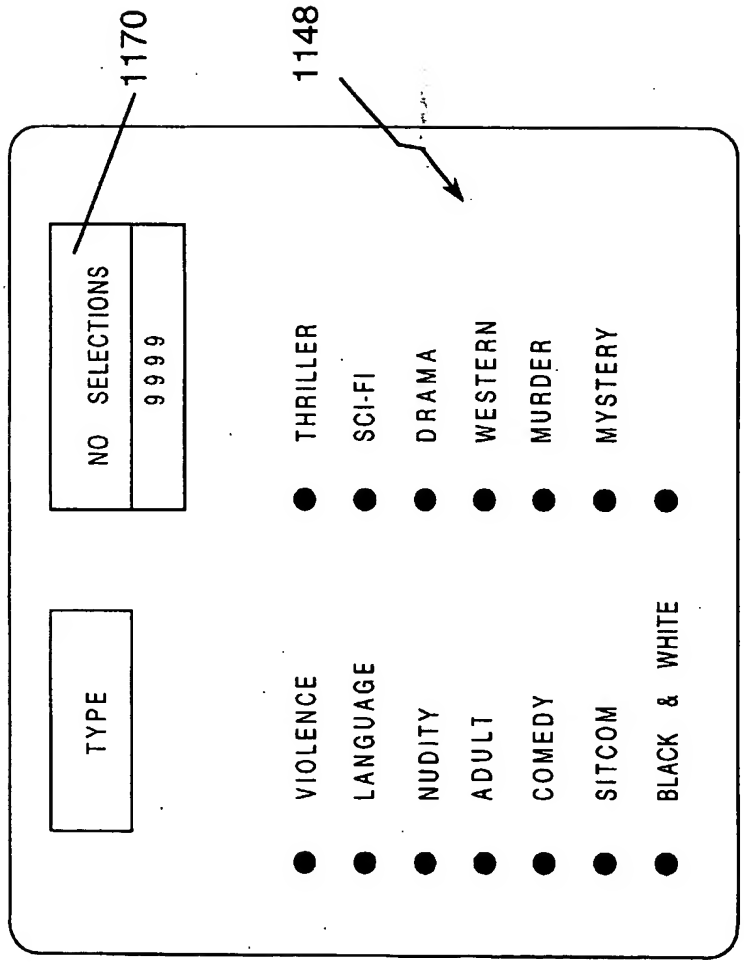

1170
1148
NO SELECTIONS
9999
TYPE
VIOLENCE
LANGUAGE
NUDITY
ADULT
COMEDY
SITCOM
BLACK & WHITE
THRILLER
SCI-FI
DRAMA
WESTERN
MURDER
MYSTERY
SUBMENU
1146

FIG. 11c

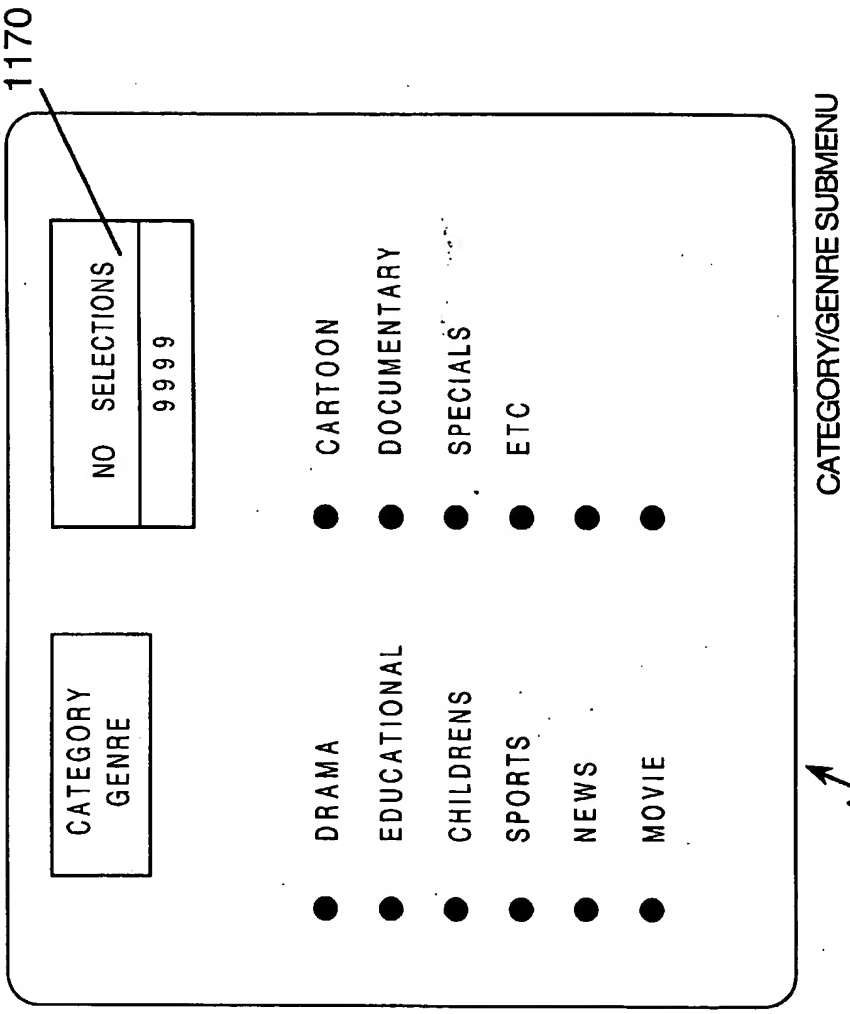

1170
NO SELECTIONS
9999
CATEGORY
GENRE
DRAMA
EDUCATIONAL
CHILDRENS
SPORTS
NEWS
MOVIE
CARTOON
DOCUMENTARY
SPECIALS
ETC
CATEGORY/GENRE SUBMENU
1154

FIG. 11d

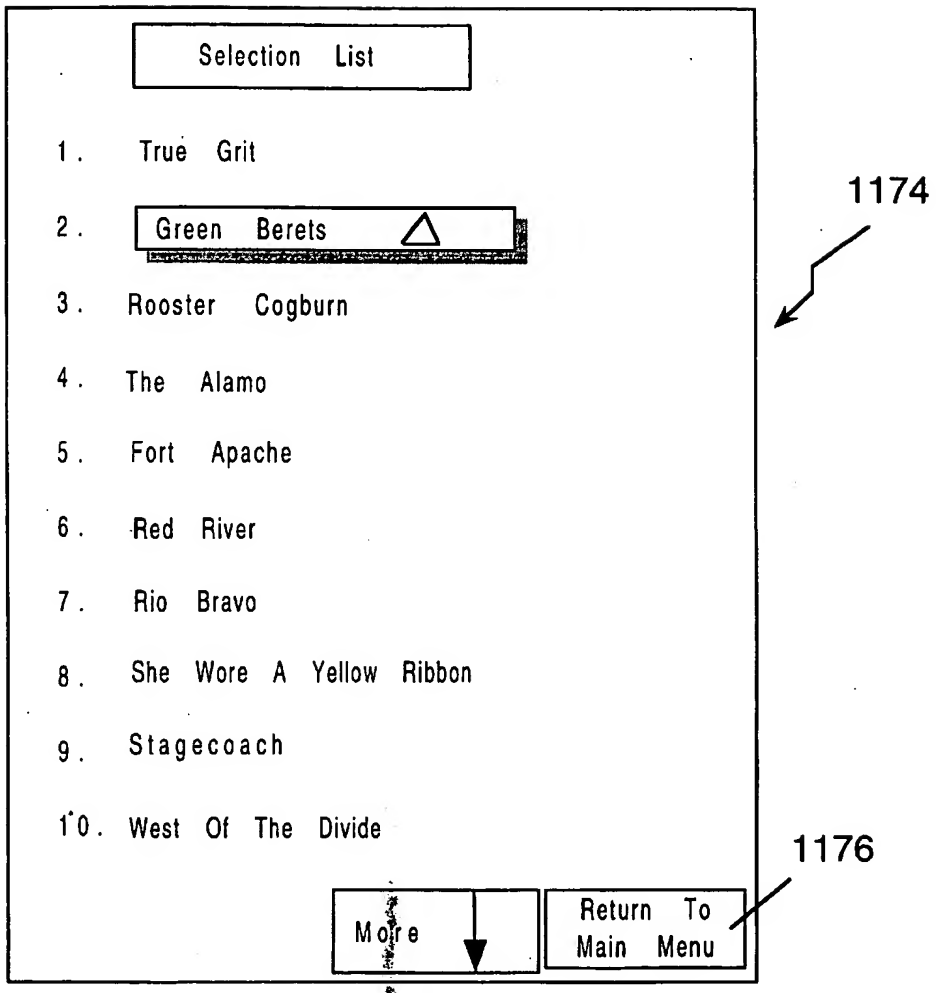

Selection List
1. True Grit
2. Green Berets
3. Rooster Cogburn
4. The Alamo
5. Fort Apache
6. Red River
7. Rio Bravo
8. She Wore A Yellow Ribbon
9. Stagecoach
10. West Of The Divide
More
Return To Main Menu
1174
1176

FIG. 11e

Fig. 12a

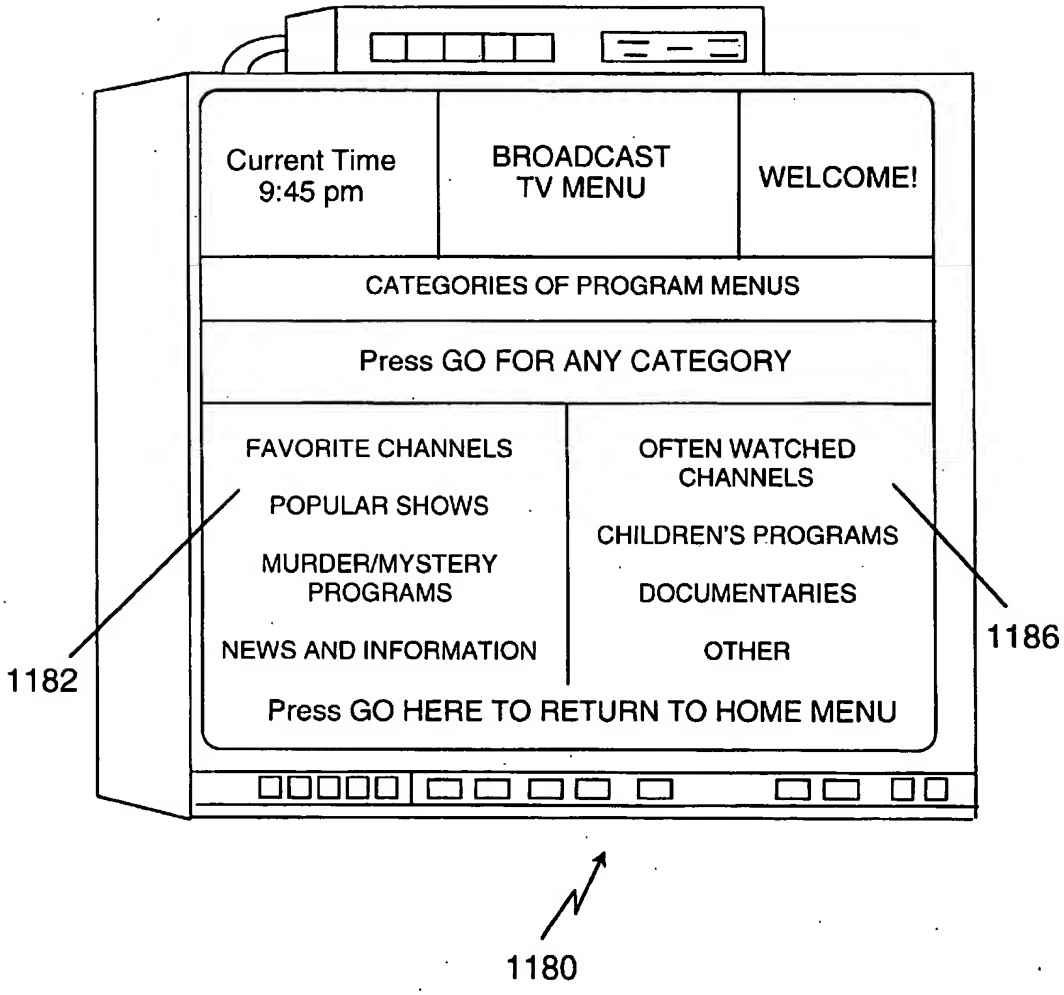
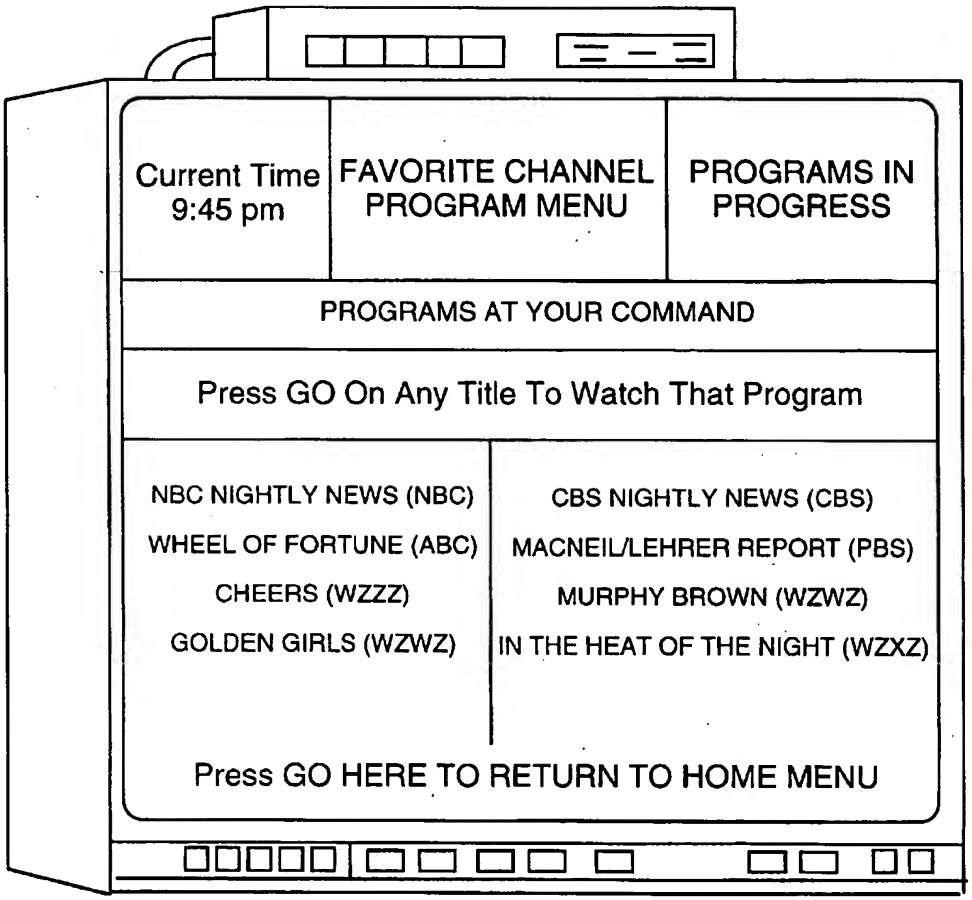

Current Time
9:45 pm
BROADCAST
TV MENU
WELCOME!
CATEGORIES OF PROGRAM MENUS
Press GO FOR ANY CATEGORY
FAVORITE CHANNELS
POPULAR SHOWS
MURDER/MYSTERY
PROGRAMS
NEWS AND INFORMATION
OFTEN WATCHED
CHANNELS
CHILDREN'S PROGRAMS
DOCUMENTARIES
OTHER
Press GO HERE TO RETURN TO HOME MENU
1182
1186
1180

Fig. 12b


Current Time
9:45 pm
FAVORITE CHANNEL
PROGRAM MENU
PROGRAMS IN
PROGRESS
PROGRAMS AT YOUR COMMAND
Press GO On Any Title To Watch That Program
NBC NIGHTLY NEWS (NBC)
WHEEL OF FORTUNE (ABC)
CHEERS (WZZZ)
GOLDEN GIRLS (WZWZ)
CBS NIGHTLY NEWS (CBS)
MACNEIL/LEHRER REPORT (PBS)
MURPHY BROWN (WZWZ)
IN THE HEAT OF THE NIGHT (WZXZ)
Press GO HERE TO RETURN TO HOME MENU
1184

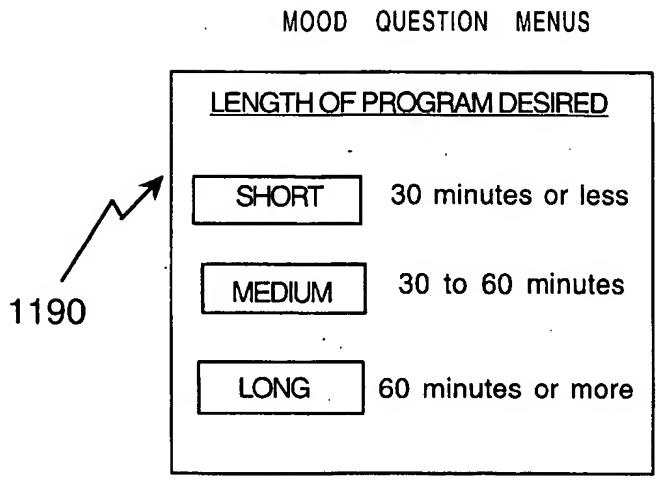


FIG. 12c

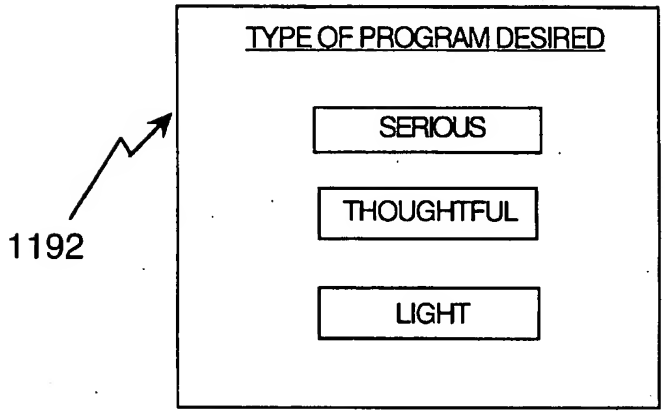


FIG. 12d

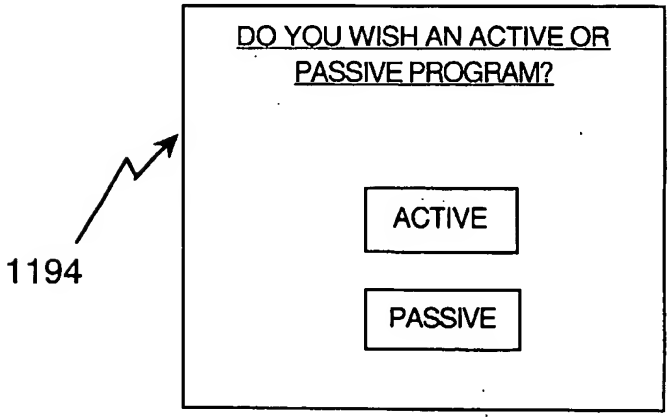


FIG. 12e

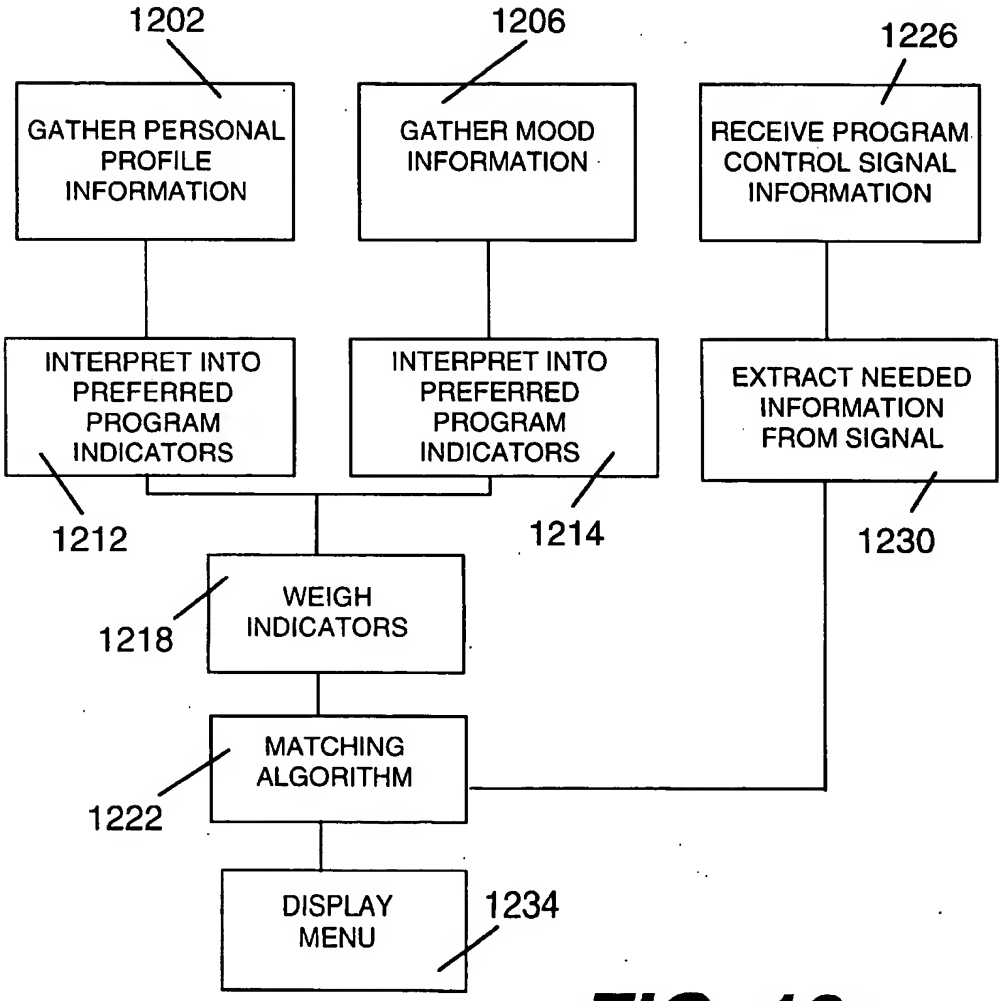

1202
1206
1226
GATHER PERSONAL PROFILE INFORMATION
GATHER MOOD INFORMATION
RECEIVE PROGRAM CONTROL SIGNAL INFORMATION
INTERPRET INTO PREFERRED PROGRAM INDICATORS
INTERPRET INTO PREFERRED PROGRAM INDICATORS
EXTRACT NEEDED INFORMATION FROM SIGNAL
1212
1214
1230
1218
WEIGH INDICATORS
1222
MATCHING ALGORITHM
DISPLAY MENU
1234

FIG. 13a

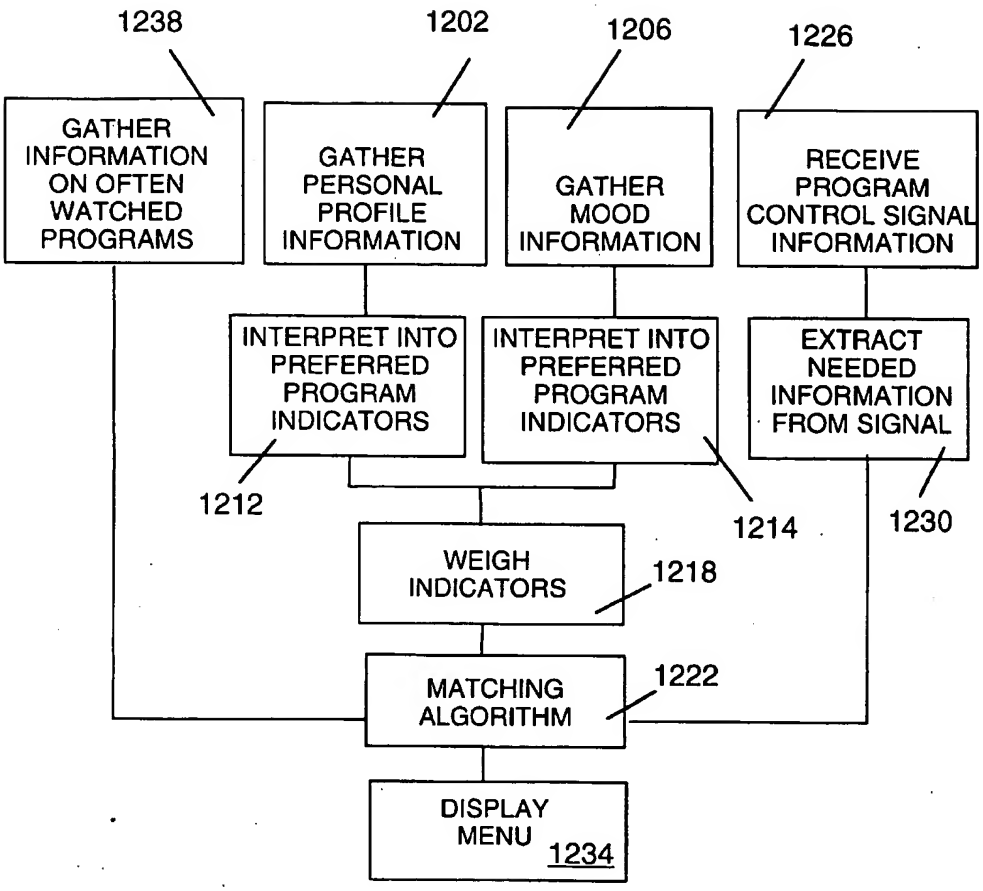
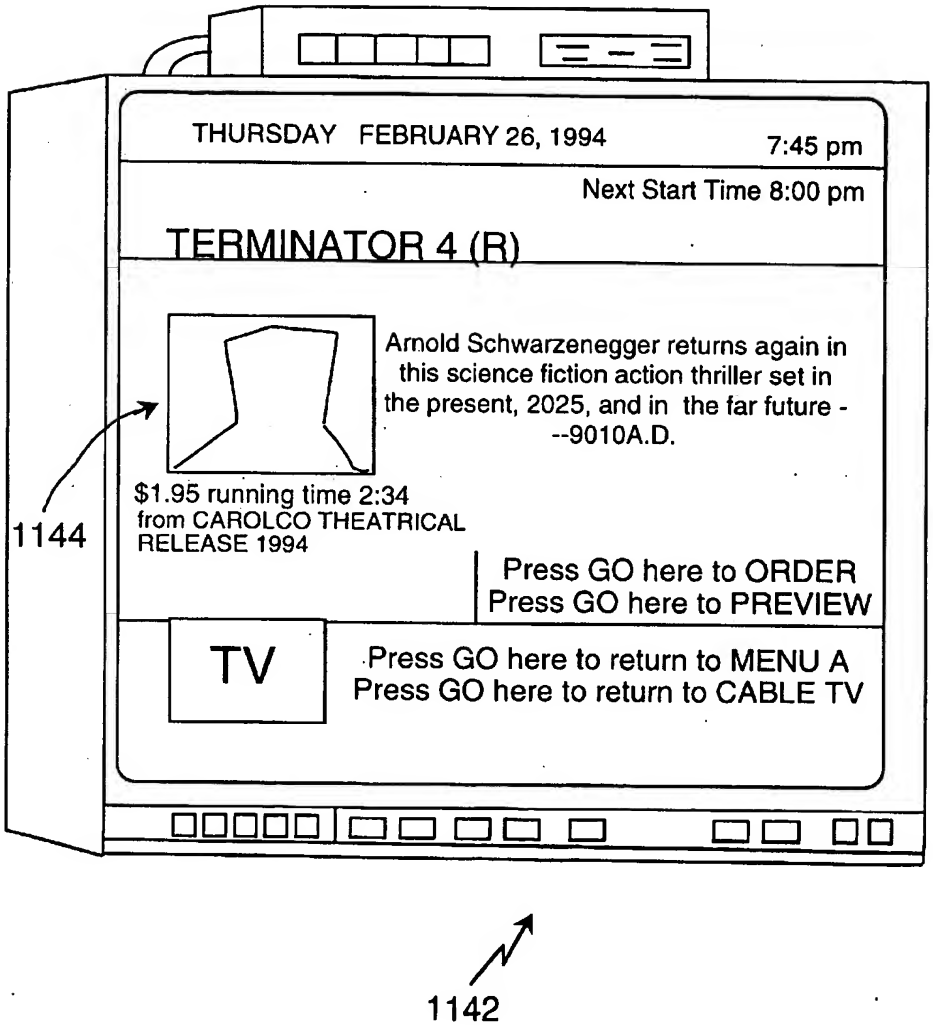

1238
1202
1206
1226
GATHER INFORMATION ON OFTEN WATCHED PROGRAMS
GATHER PERSONAL PROFILE INFORMATION
GATHER MOOD INFORMATION
RECEIVE PROGRAM CONTROL SIGNAL INFORMATION
INTERPRET INTO PREFERRED PROGRAM INDICATORS
INTERPRET INTO PREFERRED PROGRAM INDICATORS
EXTRACT NEEDED INFORMATION FROM SIGNAL
1212
1214
1230
WEIGH INDICATORS
1218
MATCHING ALGORITHM
1222
DISPLAY MENU
1234

FIG. 13b

Fig. 14


THURSDAY FEBRUARY 26, 1994
7:45 pm
Next Start Time 8:00 pm
TERMINATOR 4 (R)
Arnold Schwarzenegger returns again in this science fiction action thriller set in the present, 2025, and in the far future - --9010A.D.
$1.95 running time 2:34
from CAROLCO THEATRICAL RELEASE 1994
1144
Press GO here to ORDER
Press GO here to PREVIEW
TV
Press GO here to return to MENU A
Press GO here to return to CABLE TV
1142

REPROGRAMMABLE TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM

RELATED APPLICATIONS

This application is a divisional of application Ser. No. 08/160,281, now U.S. Pat. No. 5,798,785, filed Dec. 2, 1993, entitled TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM, which is a continuation-in-part of application Ser. No. 07/991,074 filed Dec. 9, 1992 entitled TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM WITH MENU DRIVEN SUBSCRIBER ACCESS. The following other continuation-in-part applications, also based on the above-referenced patent application, are incorporated herein by reference:

- Ser. No. 08/160,280, now U.S. Pat. No. 5,600,364, entitled NETWORK CONTROLLER FOR CABLE TELEVISION DELIVERY SYSTEMS, filed Dec. 2, 1993;
- Ser. No. 08/160,282, now U.S. Pat. No. 5,659,350, entitled AN OPERATIONS CENTER FOR A TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM, filed Dec. 2, 1993;
- Ser. No. 08/160,193, now U.S. Pat. No. 5,734,853, entitled SET-TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, filed Dec. 2, 1993;
- Ser. No. 08/160,194, now U.S. Pat. No. 5,990,927, entitled ADVANCED SET-TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, filed Dec. 2, 1993; and
- Ser. No. 08/160,283, now U.S. Pat. No. 5,682,195, entitled DIGITAL CABLE HEADEND FOR CABLE TELEVISION DELIVERY SYSTEM, filed Dec. 2, 1993.

BACKGROUND OF THE INVENTION

The invention relates to television entertainment systems for providing television programming to consumer homes. More particularly, the invention relates to a user friendly system for providing consumers with television programming choices.

Advances in television entertainment have been primarily driven by breakthroughs in technology. In 1939, advances on Vladmir Zworykin's picture tube provided the stimulus for NBC to begin its first regular broadcasts. In 1975, advances in satellite technology provided consumers with increased programming to homes.

Many of these technology breakthroughs have produced inconvenient systems for consumers. One example is the ubiquitous three remote control home, having a separate and unique remote control for the TV, cable box and VCR More recently, technology has provided cable users in certain parts of the country with 100 channels of programming. This increased program capacity is beyond the ability of many consumers to use effectively. No method of managing the program choices has been provided to consumers.

Consumers are demanding that future advances in television entertainment, particularly programs and program choices, be presented to the consumer in a user friendly manner. Consumer preferences, instead of technological breakthroughs, will drive the television entertainment market for at least the next 20 years. As computer vendors have experienced a switch from marketing new technology in computer hardware to marketing better useability, interfaces and service, the television entertainment industry will also experience a switch from new technology driving the market to consumer useability driving the market.

Consumers want products incorporating new technology that are useful, and will no longer purchase new technology for the sake of novelty or status. Technological advances in sophisticated hardware are beginning to surpass the capability of the average consumer to use the new technology. Careful engineering must be done to make entertainment products incorporating new technology useful and desired by consumers.

In order for new television entertainment products to be successful, the products must satisfy consumer demands. TV consumers wish to go from limited viewing choices to a variety of choices, from no control of programming to complete control. Consumers wish to advance from cumbersome and inconvenient television to easy and convenient television and keep costs down. Consumers do not wish to pay for one hundred channels when due to lack of programming information, they seldom, if ever, watch programming on many of these channels.

The concepts of interactive television, high definition television and 300 channel cable systems in consumer homes will not sell if they are not packaged, delivered and presented in a useable fashion to consumers. The problem is that IV programming is not being presented to consumers in a user friendly manner.

Consumers are already being bombarded with programming options, numerous "free" cable channels, subscription cable channels and pay-per-view choices. Any further increase in TV entertainment choices, without a user friendly presentation and approach, will likely bewilder viewers with a mind-numbing array of choices.

What is needed is an economical system which can present television programs through a user friendly interface which allows the consumer to easily select from among the many program choices.

What is needed is a system that assists the consumer with his program selection.

What is needed is a reprogrammable system for presenting program choices.

What is needed is a system which can be remotely reprogrammed.

What is needed is a system capable of handling hundreds of programs in different formats, be expandable for future types of programming and be inexpensive. The present invention is addressed to fulfill these needs.

SUMMARY OF INVENTION

This invention is a reprogammable terminal for television program delivery systems which is capable of suggesting programs for viewing. Specifically, the present invention may be remotely reprogrammed and is capable of assisting a subscriber in selecting television programs by suggesting programs for viewing. This is a particularly useful invention for television program delivery systems with hundreds of channels of programming and a menu driven program selection system.

Preferably the terminal is located at the television set top and is used with a television delivery system that includes a program control information signal which carries data and identifies the available program choices. The terminal includes means for receiving incoming signals, a processor, memory and means to generate menu screens for display on a TV or monitor.

The terminal can be remotely reprogrammed using an incoming signal. Preferably a software interrupt followed by a memory location or software line number is transmitted via an incoming signal. This is followed by the new software programming which is written into memory at the set top terminal. Using this method, basic programming as well as menu formats, templates, logos, colors etc. may be changed.

The terminal of the present invention can also help a subscriber in selecting programs by suggesting programs to the subscriber. The terminal suggests programs that the subscriber is most likely to watch. The terminal is capable of applying several methods of analysis and a variety of informational sources to solve the problem of choosing a program that the subscriber is most likely to watch. For example, responsive and "intelligent" methods of analysis may be used with mood, personal profile, and historical program watched and network watched data.

Responsive methods of analysis require a subscriber to respond to a variety of questions or select subjective adjectives from program driven menus. The terminal will pose the questions or lists of subjective entries using menus and the subscriber will respond using a user interface, usually an alpha-numeric remote control. For example, subscriber preferences in mood, type of program, category/genre, actor, year preference and standard rating can be selected from menus as search entries. These entries, or key words which correlate to the entries, will be used to search a program database consisting of abstracts of a multitude of programs. The search results in a list of programs which can be displayed to the user.

Intelligent methods "learn" the subscribers viewing choices through analysis of historical data generally gathered by the terminal in a passive mode.

Through a series of analysis and weighing algorithms, the terminal is able to suggest groups of programs. A menu display of the suggested programs is offered to the subscriber. Within the suggested group of programs, the terminal can also prioritize the programs and determine each programs menu position.

It is an object of the invention to provide a user friendly interface for subscribers to access television programs.

It is an object of this invention to assist viewers in choosing programs.

It is an object of this invention to allow subscribers to select a program from among hundreds of choices without a television viewing guide.

It is an object of this invention to suggest program selections to viewers.

It is an object of this invention to monitor subscriber viewing choices.

It is an object of this invention to provide a system which can be reprogrammed.

It is an object of this invention to provide a system which can be remotely reprogrammed.

It is an object of this invention to provide a system which can handle many television programs and menu selection of programs.

These and other objects and advantages of the invention will become obvious to those skilled in the art upon review of the following description, the attached drawings and appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram of the primary components of the television delivery system.

FIG. **2** is an overview of the television delivery system operations.

FIG. **3** is a schematic of the operation of the primary components of the system.

FIG. **4** is a block diagram of the hardware components of the set top terminal.

FIG. **5***a* is a perspective front view of a set top terminal.

FIG. **5***b* is a perspective rear view of a set top terminal.

FIG. **6** is a schematic of a Turbo card upgrade for a set top terminal.

FIG. **7***a* is a drawing of a frame format for a program control information signal.

FIG. **7***b* is a drawing of a frame format for a polling response from the set top terminal.

FIG. **8** is a drawing of the basic menus used in the present invention, including ten major menus represented by icons.

FIG. **9***a* is a drawing of storage for on-screen menu templates and other graphics files stored in graphics memory of the set top terminal.

FIG. **9***b* is a drawing showing the hierarchical storage of text in memory for the set top terminal.

FIG. **9***c* is a drawing of a flow chart showing the steps required for the microprocessor to retrieve, combine and display a menu.

FIGS. **10***a* and **10***b* are schematics of memory structures for reprogramming the set top terminal.

FIG. **11***a* is a drawing of the main menu used for suggesting programs based on viewer responses.

FIGS. **11***b*, **11***c*, **11***d* and **11***e* are drawings of submenus used for suggesting programs based on user responses.

FIGS. **12***a* and **12***b* are drawings of a broadcast television menu and submenu.

FIGS. **12***c*, **12***d* and **12***e* are drawings of mood question menus.

FIG. **13***a* is a drawing of a method for selecting programs for display.

FIG. **13***b* is a drawing of a more detailed method for selecting programs for display.

FIG. **14** is a drawing of a movie ordering/preview menu.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A Television Program Delivery System Description

1. Introduction

FIG. **1** shows the present invention as part of an expanded cable television program delivery system **200** that dramatically increases programming capacity using compressed transmission of television program signals. Developments in digital bandwidth compression technology now allow much greater throughput of television program signals over existing or slightly modified transmission media. The program delivery system **200** shown provides subscribers with a user friendly interface to operate and exploit a six-fold or more increase in current program delivery capability.

Subscribers are able to access an expanded television program package and view selected programs through a menu-driven access scheme that allows each subscriber to select individual programs by sequencing a series of menus. The menus are sequenced by the subscriber using simple alpha-numeric and iconic character access or moving a cursor or highlight bar on the TV screen to access desired programs by simply pressing a single button, rather than recalling from memory and pressing the actual two or more digit numeric number assigned to a selection. Thus, with the

press of a single button, the subscriber can advance from one menu to the next. In this fashion, the subscriber can sequence the menus and select a program from any given menu. The programs are grouped by category so that similar program offerings are found on the same menu.

2. Major System Components

In its most basic form, the system uses a program delivery system **200** in conjunction with a conventional concatenated cable television system **210**. The program delivery system **200** generally includes (i) at least one operations center **202**, where program packaging and control information are created and then assembled in the form of digital data, (ii) a digital compression system, where the digital data is compressed, combined/multiplexed, encoded, and mapped into digital signals for satellite transmission to the cable headend **208**, and (iii) a set of in-home decompressors. The program delivery system **200** transports the digital signals to the cable headend **208** where, the signals are transmitted through a concatenated cable television system **210**. Within the cable headend **208**, the received signals may be decoded, demultiplexed, managed by a local central distribution and switching mechanism, combined and then transmitted to the set top terminal **220** located in each subscriber's home over the cable system **210**. Although concatenated cable systems **210** are the most prevalent transmission media to the home, telephone lines, cellular networks, fiberoptics, Personal Communication Networks and similar technology for transmitting to the home can be used interchangeably with this program delivery system **200**.

The delivery system **200** has a reception region **207** with an in-home decompression capability. This capability is performed by a decompressor housed within a set top terminal **220** in each subscriber's home. The decompressor remains transparent from the subscriber's point of view and allows any of the compressed signals to be demultiplexed and individually extracted from the composite data stream and then individually decompressed upon selection by the subscriber. The decompressed video signals are converted into analog signals for television display. Such analog signals include NTSC formatted signals for use by a standard television. Control signals are likewise extracted and decompressed and then either executed immediately or placed in local storage such as a RAM. Multiple sets of decompression hardware may be used to decompress video and control signals. The set top terminal **220** may then overlay or combine different signals to form the desired display on the subscriber's television. Graphics on video or picture-on-picture are examples of such a display.

Although a single digital compression standard (e.g., MPEG) may be used for both the program delivery system **200** and the concatenated cable system **210**, the compression technique used may differ between the two systems. When the compression standards differ between the two media, the signals received by the cable headend **208** must be decompressed before transmission from the headend **208** to the set top terminals **220**. Subsequently, the cable headend **208** must recompress and transmit the signals to the set top terminal **220**, which would then decompress the signals using a specific decompression algorithm.

The video signals and program control signals received by the set top terminal **220** correspond to specific television programs and menu selections that each subscriber may access through a subscriber interface. The subscriber interface is a device with buttons located on the set top terminal **220** or on a portable remote control **900**. In the preferred system embodiment, the subscriber interface is a combined alpha-character, numeric and iconic remote control device **900**, which provides direct or menu-driven program access. The preferred subscriber interface also contains cursor movement and go buttons as well as alpha, numeric and iconic buttons. This subscriber interface and menu arrangement enables the subscriber to sequence through menus by choosing from among several menu options that are, displayed on the television screen. In addition, a user may bypass several menu screens and immediately choose a program by selecting the appropriate alpha-character, numeric or iconic combinations on the subscriber interface. In the preferred embodiment, the set top terminal **220** generates the menus that are displayed on the television by creating arrays of particular menu templates, and the set top terminal **220** displays a specific menu or submenu option for each available video signal.

3. Operations Center and Digital Compression System

The operations center **202** performs two primary services, packaging television programs and generating the program control information signal. At the operations center **202**, television programs are received from external program sources in both analog and digital form. FIG. **2** shows an embodiment of the operations center receiving signals from various external sources **212**. Examples of the external program sources are sporting events, children's programs, specialty channels, news or any other program source that can provide audio or visual signals. Once the programs are received from the external program sources, the operations center **202** digitizes (and preferably compresses) any program signals received in analog form. The operations center **202** may also maintain an internal storage of programs. The internally stored programs may be in analog or digital form and stored on permanent or volatile memory sources, including magnetic tape or RAM. Subsequent to receiving programming, the operations center **202** packages the programs into the groups and categories which provide the optimal marketing of the programs to subscribers. For example, the operations center **202** may package the same programs into different categories and menus for weekday, prime-time viewing and Saturday afternoon viewing. Also, the operations center **202** packages the television programs in a manner that enables both the various menus to easily represent the programs and the subscribers to easily access the programs through the menus.

The packaging of the digital signals is typically performed at the operations center **202** by computer assisted packaging equipment (CAP). The CAP system normally includes at least one computer monitor, keyboard, mouse, and standard video editing equipment. A programmer packages the signals by entering certain information into the CAP. This information includes the date, time slot, and program category of the various programs. The programmer and the CAP utilize demographic data and ratings in performing the packaging tasks. After the programmer selects the various programs from a pool of available programs and inputs the requisite information, the programmer, with assistance from the CAP, can select the price and allocate transponder space for the various programs. After the process is complete, the CAP displays draft menus or program schedules that correspond to the entries of the programmer. The CAP may also graphically display allocation of transponder space. The programmer may edit the menus and transponder allocation several times until satisfied with the programming schedule. During the editing, the programmer may direct the exact location of any program name on a menu with simple commands to the CAP.

The packaging process also accounts for any groupings by satellite transponder which are necessary. The operations

center **202** may send different groups of programs to different cable headends **208** and/or set top terminals **220**. One way the operations center **202** may accomplish this task is to send different program packages to each transponder. Each transponder, or set of transponders, then relays a specific program package to specific cable headends **208** and/or set top terminals **220**. The allocation of transponder space is an important task performed by the operations center **202**.

The operations center **202** may also "insert" directions for filling local available program time in the packaged signal to enable local cable and television companies to fill the program time with local advertising and/or local programming. Consequently, the local cable headends **208** are not constrained to show only programs transmitted from the operations center **202**. New set top converters will incorporate both digital and analog channels. Therefore, the cable headend **208** may combine analog signals with the digital signals prior to transmitting the program signals to the set top terminals **220**.

After the CAP packages the programs, it creates a program control information signal to be delivered with the program package to the cable headend **208** and/or set top terminal **220**. The program control information signal contains a description of the contents of the program package, commands to be sent to the cable headend **208** and/or set top terminal **220**, and other information relevant to the signal transmission.

In addition to packaging the signal, the operations center **202** employs digital compression techniques to increase existing satellite transponder capacity by at least a 4:1 ratio, resulting in a four-fold increase in program delivery capability. A number of digital compression algorithms currently exist which can achieve the resultant increase in capacity and improved signal quality desired for the system. The algorithms generally use one or more of three basic digital compression techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame (interframe) compression, and (3) within carrier compression. Specifically, in the preferred embodiment, the MPEG 2 compression method is used. After digital compression, the signals are combined (multiplexed) and encoded. The combined signal is subsequently transmitted to various uplink sites **204**.

There may be a single uplink site **204** or multiple uplink sites (represented by **204'**, shown in phantom in FIG. **1**) for each operation center **202**. The uplink sites **204** may either be located in the same geographical place or may be located remotely from the operations center **202**. Once the composite signal is transmitted to the uplink sites **204**, the signal may be multiplexed with other signals, modulated, upconverted and amplified for transmission over satellite. Multiple cable headends **208** may receive such transmissions.

In addition to multiple uplinks, the delivery system **200** may also contain multiple operations centers. The preferred method for using multiple operations centers is to designate one of the operations centers as a master operations center and to designate the remaining operations centers as slave operations centers. In this configuration, the master operations center coordinates various functions among the slave operations centers such as synchronization of simultaneous transmissions and distributes the operations workload efficiently.

4. Cable Headend

After the operations center **202** has compressed and encoded the program signals and transmitted the signals to the satellite, the cable headend **208** receives and further processes the signals before they are relayed to each set top terminal **220**. Each cable headend site is generally equipped with multiple satellite receiver dishes. Each dish is capable of handling multiple transponder signals from a single satellite and sometimes from multiple satellites.

As an intermediary between the set top terminals **220** and the operations center **202** (or other remote site), the cable headend **208** performs two primary functions. First, the cable headend **208** acts as a distribution center, or signal processor, by relaying the program signal to the set top terminal **220** in each subscriber's home. In addition, the cable headend **208** acts as a network controller **214** by receiving information from each set top terminal **220** and passing such information on to an information gathering site such as the operations center **202**.

FIG. **3** shows an embodiment where the cable headend **208** and the subscriber's home are linked by certain communications media **216**. In this particular embodiment, analog signals, digitally compressed signals, other digital signals and up-stream/interactivity signals are sent and received over the media **216**. The cable headend **208** provides such signaling capabilities in its dual roles as a signal processor **209** and network controller **214**.

As a signal processor **209**, the cable headend **208** prepares the program signals that are received by the cable headend **208** for transmission to each set top terminal **220**. In the preferred system, the signal processor **209** re-routes or demultiplexes and recombines the signals and digital information received from the operations center **202** and allocates different portions of the signal to different frequency ranges. Cable headends **208** which offer different subscribers different program offerings may allocate the program signals from the operations center **202** in various manners to accommodate different viewers. The signal processor **209** may also incorporate local programming and/or local advertisements into the program signal and forward the revised signal to the set top terminals **220**. To accommodate this local programming availability, the signal processor **209** must combine the local signal in digital or analog form with the operations center program signals. If the local cable system uses a compression standard that is different than the one used by the operations center **202**, the signal processor **209** must also decompress and recompress incoming signals so they may be properly formatted for transmission to the set top terminals **220**. This process becomes less important as standards develop (i.e., MPEG 2). In addition, the signal processor **209** performs any necessary signal decryption and/or encryption.

As a network controller **214**, the cable headend **208** performs the system control functions for the system. The primary function of the network controller **214** is to manage the configuration of the set top terminals **220** and process signals received from the set top terminals **220**. In the preferred embodiment, the network controller **214** monitors, among other things, automatic poll-back responses from the set top terminals **220** remotely located at each subscribers' home. The polling and automatic report-back cycle occurs frequently enough to allow the network controller **214** to maintain accurate account and billing information as well as monitor authorized channel access. In the simplest embodiment, information to be sent to the network controller **214** will be stored in RAM within each subscriber's set top terminal **220** and will be retrieved only upon polling by the network controller **214**. Retrieval may, for example, occur on a daily, weekly or monthly basis. The network controller **214** allows the system to maintain complete information on all programs watched using a particular set top terminal **220**.

The network controller **214** is also able to respond to the immediate needs of a set top terminal **220** by modifying a

program control information signal received from the operations center **202**. Therefore, the network controller **214** enables the delivery system to adapt to the specific requirements of individual set top terminals **220** when the requirements cannot be provided to the operations center **202** in advance. In other words, the network controller **214** is able to perform "on the fly programming" changes. With this capability, the network controller **214** can handle sophisticated local programming needs such as, for example, interactive television services, split screen video, and selection of different foreign languages for the same video. In addition, the network controller **214** controls and monitors all compressors and decompressors in the system.

The delivery system **200** and digital compression of the preferred embodiment provides a one-way path from the operations center **202** to the cable headend **208**. Status and billing information is sent from the set top terminal **220** to the network controller **214** at the cable headend **208** and not directly to the operations center **202**. Thus, program monitoring and selection control will take place only at the cable headend **208** by the local cable company and its decentralized network controllers **214** (i.e., decentralized relative to the operations center **202**, which is central to the program delivery system **200**). The local cable company will in turn be in communication with the operations center **202** or a regional control center (not shown) which accumulates return data from the set top terminal **220** for statistical or billing purposes. In alternative system embodiments, the operations center **202** and the statistical and billing sites are collocated. Further, telephone lines with modems are used to transfer information from the set top terminal **220** to the statistical and billing sites.

5. Set Top Terminal

The set top terminal **220** is the portion of the delivery system **200** that resides in the home of a subscriber. The set top terminal **220** is usually located above or below the subscriber's television, but it may be placed anywhere in or near the subscriber's home as long as it is within the range of the subscriber's remote control device **900**. In some aspects, the set top terminal **220** may resemble converter boxes already used by many cable systems. For instance, each set top terminal **220** may include a variety of error detection, decryption, and coding techniques such as anti-taping encoding. However, it will become apparent from the discussion below that the set top terminal **220** is able to perform many functions that an ordinary converter box cannot perform.

The set top terminal **220** has a plurality of input and output ports to enable it to communicate with other local and remote devices. The set top terminal **220** has an input port that receives information from the cable headend **208**. In addition, the unit has at least two output ports which provide communications from the set top terminal **220** to a television and a VCR. Certain menu selections may cause the set top terminal **220** to send control signals directly to the VCR to automatically program or operate the VCR. Also, the set top terminal **220** contains a phone Jack which can be used for maintenance, trouble shooting, reprogramming and additional customer features. The set top terminal **220** may also contain stereo/audio output terminals and a satellite dish input port.

Functionally, the set top terminal **220** is the last component in the delivery system chain. The set top terminal **220** receives compressed program and control signals from the cable headend **208** (or, in some cases, directly from the operations center **202**). After the set top terminal **220** receives the individually compressed program and control signals, the signals are demultiplexed, decompressed, converted to analog signals (if necessary) and either placed in local storage (from which the menu template may be created), executed immediately, or sent directly to the television screen.

After processing certain signals received from the cable headend **208**, the set top terminal **220** is able to store menu templates for creating menus that are displayed on a subscriber's television by using an array of menu templates. Before a menu can be constructed, menu templates must be created and sent to the set top terminal **220** for storage. A microprocessor uses the control signals received from the operations center **202** or cable headend **208** to generate the menu templates for storage. Each menu template may be stored in volatile memory in the set top terminal **220**. When the set top terminal receives template information it demultiplexes the program control signals received from the cable headend **208** into four primary parts: video, graphics, program logic and text. Each menu template represents a different portion of a whole menu, such as a menu background, television logo, cursor highlight overlay, or other miscellaneous components needed to build a menu. The menu templates may be deleted or altered using control signals received from the operations center **202** or cable headend **208**.

Once the menu templates have been stored in memory, the set top terminal **220** can generate the appropriate menus. In the preferred embodiment, the basic menu format information is stored in memory located within the set top terminal **220** so that the microprocessor may locally access the information from the set top terminal instead of from an incoming signal. The microprocessor next generates the appropriate menus from the menu templates and the other menu information stored in memory. The set top terminal **220** then displays specific menus on the subscriber's television screen that correspond to the inputs the subscriber selects.

If the subscriber selects a specific program from a menu, the set top terminal **220** determines on which channel the program is being shown, demultiplexes and extracts the single channel transmitted from the cable headend **208**. The set top terminal **220** then decompresses the channel and, if necessary, converts the program signal to an analog NTSC signal to enable the subscriber to view the selected program. The set top terminal **220** can be equipped to decompress more than one program signal, but this would unnecessarily add to the cost of the unit since a subscriber will generally only view one program at a time. However, two or three decompressors may be desirable to provide picture-on-picture capability, control signal decompression, enhanced channel switching or like features.

In addition to menu information, the set top terminal **220** may also store text transmitted from the cable headend **208** or the operations center **202**. The text may inform the subscriber about upcoming events, billing and account status, new subscriptions, or other relevant information. The text will be stored in an appropriate memory location depending on the frequency and the duration of the use of the textual message.

Also, optional upgrades are available to enhance the performance of a subscriber's set top terminal **220**. These upgrades may consist of a cartridge or computer card (not shown) that is inserted into an expansion slot in the set top terminal **220** or may consist of a feature offered by the cable headend **208** or operations center **202** to which the user may subscribe. Available upgrades may include on line data base services, interactive multi-media services, access to digital radio channels, and other services.

In the simplest embodiment, available converter boxes such as those manufactured by General Instruments or Scientific Atlanta, may be modified and upgraded to perform the functions of a set top terminal **220**. The preferred upgrade is a circuit card with a microprocessor which is electronically connected to or inserted into the converter box.

6. Remote Control Device

The primary conduit for communication between the subscriber and the set top terminal **220** is through the subscriber interface, preferably a remote control device **900**. Through this interface, the subscriber may select desired programming through the system's menu-driven scheme or by directly accessing a specific channel by entering the actual channel number. Using the interface, the subscriber can navigate through a series of informative program selection menus. By using menu-driven, iconic or alpha-character access, the subscriber can access desired programs by simply pressing a single button rather than recalling from memory and pressing the actual channel number to make a selection. The subscriber can access regular broadcast and basic cable television stations by using either the numeric keys on the remote control **900** (pressing the corresponding channel number), or one of the menu icon selection options.

In addition to enabling the subscriber to easily interact with the cable system **200**, the physical characteristics of the subscriber interface **900** should also add to the user friendliness of the system. The remote control **900** should easily fit in the palm of the user's hand. The buttons of the preferred remote control **900** contain pictorial symbols that are easily identifiable by the subscriber. Also, buttons that perform similar functions may be color coordinated and consist of distinguishing textures to increase the user friendliness of the system.

7. Menu-Driven Program Selection

The menu-driven scheme provides the subscriber with one-step access to all major menus, ranging from hit movies to sport specials to specialty programs. From any of the major menus, the subscriber can in turn access submenus and minor menus by cursor or alpha-character access.

There are two different types of menus utilized by the preferred embodiment, the Program Selection menus and the During Program menus. The first series of menus, Program Selection menus, consists of an Introductory, a Home, Major menus, and Submenus. The second series of menus, During Program menus, consists of two primary types, Hidden menus and the Program Overlay menus.

Immediately after the subscriber turns on the set top terminal **220**, the Introductory menu welcomes the subscriber to the system. The Introductory menu may display important announcements from the local cable franchise, advertisements from the cable provider, or other types of messages. In addition, the Introductory menu can inform the subscriber if the cable headend **208** has sent a personal message to the subscriber's particular set top terminal **220**.

After the Introductory menu has been displayed the subscriber may advance to the next level of menus, namely the Home menu. In the preferred embodiment, after a certain period of time, the cable system will advance the subscriber by default to the Home menu. From the Home menu, the subscriber is able to access all of the programming options. The subscriber may either select a program directly by entering the appropriate channel number from the remote control **900**, or the subscriber may sequence through incremental levels of menu options starting from the Home menu. The Home menu lists categories that correspond to the first level of menus called Major menus.

If the subscriber chooses to sequence through subsequent menus, the subscriber will be forwarded to the Major menu that corresponds to the chosen category from the Home menu. The Major menus further refine a subscriber's search and help guide the subscriber to the selection of his choice.

From the Major menus, the subscriber may access several submenus. From each submenu, the subscriber may access other submenus until the subscriber finds a desired television program. Similar to the Major menu, each successive level of Submenus further refines the subscriber's search. The system also enables the subscriber to skip certain menus or submenus and directly access a specific menu or television program by entering the appropriate commands on the remote control **900**.

The During program menus (including Hidden Menus and Program Overlay Menus) are displayed by the set top terminal **220** only after the subscriber has selected a television program. In order to avoid disturbing the subscriber, the set top terminal **220** does not display the Hidden Menus until the subscriber selects the appropriate option to display a Hidden Menu. The Hidden Menus contain options that are relevant to the program selected by the viewer. For example, a Hidden Menu may contain options that enable a subscriber to enter an interactive mode or escape from the selected program.

Program Overlay Menus are similar to Hidden Menus because they occur during a program and are related to the program being viewed. However, the Program Overlay Menus are displayed concurrently with the program selected by the subscriber. Most Program Overlay Menus are small enough on the screen to allow the subscriber to continue viewing the selected program comfortably.

B. Detailed Set Top Terminal Description

The set top terminal **220** receives and manipulates signals from the cable headend **208**. The set top terminal **220** is equipped with local computer memory and the capability of interpreting the digitally compressed signal to produce menus for the subscriber. The remote control **900** communicates the subscriber's selections to the set top terminal **220**. The subscriber's selections are generally based upon menus or other prompts displayed on the television screen.

It is preferred that the signal reaches the subscriber's home in a compressed format and is decompressed prior to viewing. Included in the delivered program signal is information that enables equipment at the subscriber's home to display menus for choosing particular programs. Depending on the particular embodiment, the television program signal may arrive at the subscriber's home through one or more connections such as coaxial cables, fiber cables, twisted pairs, cellular telephone connections, or personal communications network (PCN) hookups.

The program control information signal is generated by the operations center **202** and provides the network controller **214** with data on the scheduling and description of programs. In an alternate configuration, this data is sent directly to the set top terminal **220** for display to the subscriber. In the preferred embodiment, the program control information signal is stored and modified by the network controller **214** and sent to the set top terminal **220** in the form of a set top terminal control information stream (STTCIS). The set top terminal **220** integrates either the program control information signal or the STTCIS with data stored in the memory of the set top terminal **220** to generate on-screen menus that assist the subscriber in choosing programs for display.

The types of information that can be sent using the program control signal include: number of program

categories, names of program categories, what channels are assigned to a specific category (such as specialty channels), names of channels, names of programs on each channel, program start times, length of programs, description of programs, menu assignment for each program, pricing, whether there is a sample video clip for advertisement for the program, and any other program, menu or product information.

With a minimal amount of information being communicated to the set top terminal **220** on a regular basis, the set top terminal **220** is able to determine the proper menu location for each program and the proper time and channel to activate for the subscriber after a menu selection. The program control information signal and STTCIS can be formatted in a variety of ways and the on-screen menus can be produced using many different methods. For instance, if the program control information signal carries no menu format information, the menu format for creating the menus can be fixed in ROM at the set top terminal **220**. In the preferred embodiment, the menu format information is stored at the set top terminal **220** in a temporary memory device such as a RAM or EPROM. New menu format information is sent via the program control information signal or the STTCIS to the set top terminals **200** whenever a change to a menu format is desired.

In the simplest embodiment, the menu formats remain fixed and only the text changes. In this way the program control information signal can be limited to primarily text and a text generator can be employed in the set top terminal **220**. Another simple embodiment uses a separate channel full-time (large bandwidth) just for the menu information.

Live video signals may be used in windows of certain menus. These video signals can be transmitted using the program control information signal or STTCIS, or can be taken off channels being transmitted simultaneously with the menu display. Video for menus, promos or demos may be sent to the set top terminal **220** in several formats, including (1) on a dedicated channel, (2) on a regular program channel and scaled to size, or (3) along with the program control information signal. However, in the preferred embodiment, a large number of short promos or demo video is sent using a split screen technique on a dedicated channel. A multiple window technique may be used with the menus to display a description of a program and one or more video frames that assist the subscriber in selecting the program.

FIG. **4** shows the basic hardware components of the set top terminal **220**. The set top terminal **220** has a tuner **603**, digital demodulator **606**, decryptor **600**, and demultiplexers **609, 616** as well as audio equipment **612** and a remote control interface **626** for receiving and processing signals from the remote control unit **900**. An optional modem **627** allows communication between a microprocessor **602** and the cable headend **208**. An NTSC encoder **625** provides a standard NTSC video output.

The microprocessor **602** is capable of executing program instructions stored in memory. These instructions allow a user to access various menus by making selections on the remote control **900**.

The manner in which the video is decompressed and the menus are generated from the program control information signal or STTCIS varies depending on the specific embodiment of the invention. Video decompressors **618** and **622** may be used if the video is compressed. The program control information signal may be demultiplexed into its component parts, and a video decompressor **618**, graphic decompressor, text generator and video combiner **624** may be used to assist in creating the menus.

In addition to the menu format information that is stored in graphics memory, the set top terminal **220** also stores data tracking those programs that have been selected for viewing. By gathering this data, the set top terminal **220** can maintain an accurate record of all programs accessed/watched by storing the data in EEPROM or RAM. Subsequently, this data can be transmitted to the cable headend **208**, where it can be used in carrying out network control and monitoring functions. Such data transmissions between the set top terminal **220** and cable headend **208** can be accomplished, for example, through upstream transmission over the cable network or over telephone lines through the use of telephone modems. Where upstream transmission over the cable network is used, the set top terminals **220** can complete data transmissions on a scheduled (e.g., using a polling response or status report to respond to polling requests sent from the cable headend **208**) or as-needed (e.g., using a random access technique) basis.

FIG. **5***a* shows the front panel of the set top terminal **220**, which includes an infrared sensor **630** and a series of LED displays **640**. The LED displays **640** may indicate with an icon or a letter (e.g. A–K) the major menu currently selected by the set top terminal **220** or the channels selected directly by a user, or menu channel selections (e.g., from 1 to 50). Further displays may include current channel, time, volume level, sleep time, parental lock (security), account balance, use of a hardware upgrade, second channel being recorded by VCR, use of the Level D music hardware upgrade in a separate room, and any other displays useful to a subscriber to indicate the current status of the set top terminal **220**. The LEDs **640** may also provide an indication of the digital audio channel currently tuned.

The set top terminal **220** includes a flapped opening **635** on its front that allows the insertion of a magnetic cartridge (or similar portable storage device, including optical disk, ROM, EPROM, etc. not shown). This cartridge opening **635** allows the set top terminal **220** to be upgraded or reprogrammed locally with the use of a magnetic tape cartridge.

On the top or cover of the set top terminal **220** are located pushbutton controls **645**. Any function that can be performed on the remote **900** may also be performed at the set top terminal **220** using the duplicative pushbutton controls **645**.

FIG. **5***b* shows the back of the set top terminal **220**, which includes a pair of output terminals **650**, pair of input terminals **652**, pair of stereo/audio output terminals **654**, satellite dish input port **656**, telephone jack **658** and an RS-422 port **660**. In addition, an upgrade port **662** and a cover plate **664** are held in place by a series of sheet metal screws. One of the output terminals **650** is for a television and the other is for a VCR. The set top terminal **220** is equipped to handle incoming signals on one or two cables using the input terminals **652**. The phone jack **658** and an RS-232 or RS-422 port **660** are provided for maintenance, trouble shooting, reprogramming and additional customer features. In alternate embodiments, the telephone Jack **658** may be used as the primary mode of communication between the cable headend **208** and the set top terminal **220**. This connection is possible through the local telephone, cellular telephone or a personal communications network (PCN).

The basic programming of each set top terminal **220** is located on ROM within the set top terminal **220**. Random access memory, the magnetic cartridge capability, and the expansion card slot **635** each allow upgrades and changes to be easily made to the set top terminal **220**.

In the preferred embodiment, the set top terminal **220** includes a hardware upgrade port **662**, in addition to expan-

sion card slots. The hardware upgrade port **662** accommodates a four-wire (or more) connection for: (1) error corrected, decrypted data output of the set top terminal **220**, (2) a control interface, (3) decompressed video output, and (4) a video input port. In the preferred embodiment, multiple wires are used to perform each of the four functions. The four sets of wires are combined in a single cable with a single multipin connector.

In the preferred embodiment, multipin connections may be used for the multiwire cable. The multipin connection **662** may range from DB9 to DB25. A variety of small computer systems interface (SCSI) ports may also be provided. Alternatively, four or more ports may be provided instead of the single port depicted.

Another port **662** is used to attach the various hardware upgrades described below to a set top terminal **220**. The preferred embodiment has a number of hardware upgrades available for use with a set top terminal **220**, including: (1) a Level A interactive unit, (2) a Level B interactive unit, (3) a Level C interactive unit with compact disc capability, (4) a Level D digital radio tuner for separate room use, and (5) a Level E information download unit. Each of these upgrades may be connected to the set top terminal **220** unit through the upgrade port **662** described earlier. The same four wires in a single cable described earlier maybe used.

Existing set top converter boxes such as those made by Scientific Atlanta or General Instruments are presently unequipped to handle the menu selection system of the present invention. Thus, hardware modifications are necessary in order to use the menu selection system with existing set top converter technology.

A Turbo Card addition to a set top converter is depicted in FIG. **6**. The Turbo Card **700** shown provides the additional functionality needed to utilize the menu system with existing set top converter technology. The primary functions the Turbo Card **700** adds to the set top converter are the interpreting of program control information signals, generating of menus, sequencing of menus, and, ultimately, the ability of the viewer to select a channel through the menu system without entering any channel identifying information. The turbo card also provides a method for a remote location, such as the cable headend **208**, to receive information on programs watched and control the operation of the set top converter and Turbo Card **700**. The programs watched information and control commands may be passed from the cable headend **208** to the Turbo Card **700** using telephone lines.

The primary components of the Turbo Card **700** are a PC chip CPU **702**, a VGA graphic controller **704**, a video combiner **706**, logic circuitry **708**, NTSC encoder **710**, a receiver **712**, demodulator **714**, and a dialer **716**. The Turbo Card **700** operates by receiving the program control information signal from the cable headend **208** through the coaxial cable. The logic circuitry **708** of the Turbo Card **700** receives data, infrared commands, and synchronization signals from the set top converter. Menu selections made by the viewer on the remote control **900** are received by the set top converter's IR equipment and passed through to the Turbo Card **700**. The Turbo Card **700** interprets the IR signal and determines the program (or menu) the viewer has selected. The Turbo Card **700** modifies the IR command to send the program selection information to the set top converter **221**. The modified IR command contains the channel information needed by the set top converter. Using the phone line and dialer **716**, the Turbo Card **700** is able to transmit program access information to the cable headend **208**.

In the preferred embodiment, program access information is stored at each set top terminal **220** until it is polled by the network controller **214** using a polling request message format as shown in FIG. **7***a*. This frame format **920** consists of six fields, namely: (1) a leading flag **922** at the beginning of the message, (2) an address field **924**, (3) a subscriber region designation **926**, (4) a set top terminal identifier **928** that includes a polling command/response (or P/F) bit **930**, (5) an information field **932**, and (6) a trailing flag **934** at the end of the message. FIG. **7***b* shows a response frame format **920'** (similar to the frame format **920** end, therefore, commonly numbered with the frame depicted in FIG. **7***a*, but with the prime indicator added for clarity) for information communicated by the set top terminal **220** to the network controller **214** in response to the polling request of FIG. **7***a*.

The eight-bit flag sequence **922** that appears at the beginning and end of a frame is used to establish and maintain synchronization. Such a sequence typically consists of a "01111110" bit-stream. The address field **924** designates a 4-bit address for a given set top terminal **220**. The subscriber region designation **926** is a 4-bit field that indicates the geographical region in which the subscriber's set top terminal **220** is housed. The set top terminal identifier **928** is a 16-bit field that uniquely identifies each set top terminal **220** with a 15-bit designation followed by an appended P/F bit **930**. Although field size is provided by this example, a variety of sizes can be used with the present invention.

The P/F bit **930** is used to command a polling response from the set top terminal **220** addressed, as described below. The response frame format **920'** also provides a variable-length information field **932'** for other data transmissions, such as information on system updates. The frame format **920'** ends with an 8-bit flag (or trailing flag) **934'** that is identical in format to the leading flag **922'**, as set forth above. Other frame formats (e.g., MPEG) will be apparent to one skilled in the art and can be easily adapted for use with the system.

As summarized above, images or programs may be selected for display by sequencing through a series of menus. FIG. **8** is an example of one possible structure for a series of menus. Generally, the sequence of menus is structured with an introductory menu, a home menu, various major menus and a multitude of submenus. The submenus can include promo menus and during program menus. For example, at the home menu portion of the sequence of menus and corresponding software routines, a subscriber may select one of the major menus and start a sequence of menu displays. Alternatively, a subscriber may go directly to a major menu by depressing a menu select button on remote control **900**.

At any time during the menu sequence, the subscriber may depress a major menu button to move into another series of menus. In this way, a subscriber may move from major menu to major menu.

The various software subroutines executed by the microprocessor **602** allow a subscriber to sequence the menus, navigating through the various menus of the present invention. A subscriber may sequence back through menus or return to the home menu with a single touch of the home menu button on remote **900**.

An introductory menu screen **1000** automatically appears upon power-up and initialization of the set top terminal **220**. From this introductory menu screen **1000**, the set top terminal software will normally advance the subscriber to the home menu screen **1010**. The home menu **1010** is the basic menu that the subscriber will return to in order to make the first level of viewing decisions. When the set top terminal software is displaying the home menu **1010**, the subscriber is able to access any television programming option. The

software allows programming options to be entered through cursor movement on the screen and directly by button selection on the remote control **900**.

In the normal progression through the menu screens, the software will forward the subscriber to a major menu screen **1020** in response to the subscriber's remote control **900** selection or highlighted cursor selection from the home menu screen **1010**. The selections displayed on the home menu **1010** are for large categories of programming options.

Following the major menu **1020**, the subscriber may navigate through one or more submenu screens **1050** from which the subscriber may choose one particular program for viewing. For most programming selections, the user will proceed from the home menu **1010** to a major menu **1020** and then to one or more submenus **1050**. However, for certain programming options or functions of the set top terminal **220**, the user may skip one or more menus in the sequence.

The During Program Menus **1200** are submenus enabled by the set top terminal software only after the subscriber has selected a television program. These menus provide the subscriber with additional functionality and/or additional information while viewing a selected program. The During Program Menus **1200** sequence can be further subdivided into at least two types of menus, Hidden Menus **1380** and Program Overlay Menus **1390**.

To avoid disturbing a subscriber during viewing of a program, the Hidden Menus **1380** are not shown to the subscriber but instead "reside" at the set top terminal **220** microprocessor **602**. The microprocessor **602** awaits a button entry either from the remote control **900** or set top terminal **220** buttons before executing or displaying any Hidden Menu **1380** options. The set top terminal software provides the subscriber with additional functions such as entering an interactive mode or escaping from a selected program through use of Hidden Menus **1380**.

Program Overlay Menus **1390** are similar to Hidden Menus **1380**. However, the Program Overlay Menus **1390** are overlayed onto portions of the displayed video and not hidden. The software for the Program Overlay Menus **1390** allows the subscriber to continue to watch the selected television program with audio but places graphical information on a portion of the television screen. Most Program Overlay Menus **1390** are graphically generated to cover small portions of video. Some Overlays **1390** which are by their nature more important than the program being viewed will overlay onto greater portions of the video. Examples of types of overlay menus **1390** include Notification Menus **1392** and Confirmation Menus **1394**. In the preferred embodiment, the software for the Program Overlay Menus **1390** controls the reduction or scales down the (entire) programs video and redirects the video to a portion of the screen.

Submenus provide the cost of viewing the program and the program's length in hours and minutes. From the submenus, the subscriber is given at least free options: (1) to purchase a program, (2) to return to the previous menu, and (3) to press "go" and return to regular TV. The subscriber may also be given other options such as previewing the program.

Using an on-screen menu approach to program selection, there is nearly an unlimited number of menus that can be shown to the subscriber. The memory capability of the set top terminal **220** and the quantity of information that is sent using the program control Information signal are the only limits on the number of menus and amount of information that can be displayed to the subscriber. The approach of using a series of menus in a simple tree sequence is both easy for the subscriber to use and simply implemented by the set top terminal **220** and remote control device **900** with cursor movement. A user interface software programmer will find many obvious variations from the preferred embodiment described.

The set top terminal **220** generates and creates menus using, in part, information stored in its graphics memory. A background graphics file **800** will store menu backgrounds and a logo graphics file will store any necessary logos. A menu display and cursor graphics file will store menu display blocks and cursor highlight overlays as well as any other miscellaneous files needed to build the menus. Using this method of storing menus, the menus can be changed by reprogramming the graphics memory of the set top terminal **220** through instructions from either the network controller **214** or operations center **202**.

The microprocessor **602** performs the steps required to create a menu using stored information. The microprocessor **602** fetches a background file, logo file, menu display and cursor file in most instances. The microprocessor **602** fetches text from long-term, intermediate-term, or short-term storage depending on where the text is stored. Using a video combiner (or like device), the stored information is combined with video and the entire image is sent to the television screen for display.

In the preferred embodiment, a graphics controller is used to assist the set top terminal **220** in generating menus. Menu generation by the set top terminal **220** begins with the building of a major menu screen, which includes background graphics for that major menu. The background graphics may include an upper sash across the top of the screen and a lower sash across the bottom of the screen. The background graphics may be generated from the background graphics file **800** in the memory files of the graphics memory (preferably EEPROM). In addition, logo graphics may be generated. Such graphics typically include an icon window, a cable company logo, a channel company logo, and two "go" buttons.

Preferably, the text for each major menu is generated separately by a text generator in the set top terminal **220**. Those portions of the text that generally remain the same for a period of weeks or months may be stored in EEPROM or other local storage. Text which changes on a regular basis, such as the movie titles (or other program selections), is transmitted to the set top terminal **220** by either the operations center **202** or the network controller **214** of the cable headend **208**. In this manner, the cable headend **208** may change the program selections available on any major menu **1020** by modifying the program control information signal sent by the operations center **202** and transmitting any changes using the STTCIS.

Day, date and time information are added to each major menu. This information is sent from the operations center **202**, the cable headend **208** (signal processor **209** or network controller **214**), the uplink site, or generated by the set top terminal **220** internally.

The creation and display of program description submenus is performed by the set top terminal **220** in a manner similar to that described above. Each submenu may be created in parts and combined before being sent to the television screen. Preferably, background graphics and upper and lower sashes are used. Likewise, a video window and half-strip window can be generated from information in storage on the EEPROM.

In addition to graphics and text, some submenus include windows that show video. Such video may be still or moving

pictures. Still pictures may be stored in a compressed format (such as JPEG) at the set top terminal **220**. Video stills may be transmitted by the operations center **202** through the program control information signal from time to time.

Moving video picture is obtained directly from a current video feed as described above. Depending on video window size, this may require manipulation of the video signal, including scaling down the size of the video and redirecting the video to the portion of the menu screen which is within the video window of the menu. Alternatively, the video may be obtained from a split screen channel. Such a method involves the use of split screen video techniques to send multiple video clips on a single channel at a given time. The set top terminal **220** would scale the picture, if necessary, and redirect it to the correct position on the screen using known scaling and positioning techniques. Additional circuitry may be required in the set top terminal **220** to perform adequate scaling and repositioning.

To avoid the need for redirecting video into the portion of the screen which houses the video window, masking and menu graphics may be used to cover the portions of the channel video that are not needed. This masking technique allows the split screen video to remain in the same portion of the screen that it is transmitted by the operations center **202**. The masking is then adjusted to cover the undesired portions of the screen. These masks are stored in the background graphics file similarly to other background files for menus.

The split screen video technique may also be used for promoting television programming. Since a great number of short video clips may be sent continuously, full or partial screen promotionals (or informationals) may be provided to the subscriber. With this large quantity of promotional video, the subscriber is given the opportunity to "graze" through new movie or television programming selections. The subscriber simply grazes from promotional video to promotional video until the desired television program is discovered.

C. Program Control Information Signal

Throughout the present application, the term "program control information" is being used to indicate control information coming from the cable headend **208** to the set top terminal **220**, whether it is sent directly from the Operations Center **202**, processed by the network controller **214** and then forwarded to the set top box, or transmitted over telephone lines.

The program control information signal generated by the Operations Center **202** provides data on the scheduling and description of programs to the network controller **214** or, in an alternate configuration, directly to the set top terminal **220** for display to the subscriber. In the preferred embodiment, the program control information signal is stored and modified by the network controller **214** and sent to the set top terminal **220** in the form of a set top terminal control information stream (STTCIS). This configuration is required to accommodate differences in individual cable systems and possible differences in set top terminal devices. The set top terminal **220** integrates either the program control information signal or the set top terminal control information stream together with data stored in the memory of the set top terminal **220**, to generate on-screen displays for assisting the subscriber in choosing programs.

The goal of the menu driven program selection system **200** is to allow the subscriber to choose a program by touring through a series of menus, organized generally as depicted in FIG. **8**, utilizing the remote control **900** for cursor movement. The final choice in the series of menus will identify one particular channel and one time for activation of that channel. Armed with a channel and activation time the set top terminal **220** can display the selected program on the television for the viewer. To achieve this goal a simple embodiment assigns an intelligent alpha-numeric code to each program. This alpha-numeric code identifies the category of the program, the menu in which the program should be displayed, its transmission time(s), and the position on the menu that the program should be displayed.

In this simple embodiment, the program control information, including menu codes, is sent continuously from the Operations Center **202** to the network controller **214**, and ultimately to the set top terminal **220**. For example, four hours worth of programming information can be sent via the program control information signal continuously as shown in Table A.

Table A shows the basic programming information that may be sent to the set top terminal **220**. The program descriptions shown are coded abbreviations. For example, C for comedy, N for news, S for sports, A for cartoons, and Tx for text. If there is a textual description for a program, such as a movie, the description may be given following that program's coded description or may be communicated following the four hours' worth of programming information. As is shown in the coded listing, program descriptions for programs greater than a half hour in length need not be repeated (each half hour). The video description code informs the set top terminal **220** of whether there is still or live video available to advertise the program.

For example, a sporting program may be assigned a code of B35-010194-1600-3.25-Michigan St. vs. USC. The letter B would assign the program to category B, sports. The second alpha-numeric character number 3 would assign the program to the third menu of the sports category. The third character of the code, number 5, assigns the program to the fifth program slot on the third menu. The next six characters, Jan. 1, 1994, represent the date. The following four characters, 1600 represent the start time which is followed by the length of the program and the program name. This entry represents a sports show, a college football game, which will be aired at 4:00 PM on New Years day 1994.

TABLE A

	*Program name	*Program length	*Menu code	*Description	*Video
PM					
	Cheers	.5	E24	C	N
	Terminator	2.0	A33	Tx	S
	PrimeTime	1.0	D14	N	N
	Football Special	.5	B24	S	N
12:30 PM					
1	Simpsons	.5	E14 & C13	C	S
4	Football Game	3.0	B13	S	N
•					
•					
•					

In the 12:30 Channel 1 entry of Table A, two menu codes are shown. By allowing two menu codes, programs that may fit under two different category descriptions may be shown in both menus to the subscriber. With this minimal amount of information being communicated to the set top terminal **220** on a regular basis, the terminal is able to determine the proper menu location for each program and the proper time and channel to activate for the subscriber after his menu selection.

Table B shows an example Events Table that may be downloaded to a set top terminal **220** using the Event.Dat file which contains information about events and pricing. As shown in the table, the three columns of the Events Table identify the field number, the field itself and the type of information downloaded in the Event.Dat file. The first column contains the field numbers 1 through **11**. The middle column contains the corresponding field parameters, including the event type, event ID, global channel ID, price, start time, end time, start date, end date, P-icon, name and description. The third column contains corresponding field type information. Field type information typically consists of an unsigned integer; hours, minutes and seconds; months, day and year; and ASCII character identifier.

TABLE B

Field #	Field	Type
1	Event Type 1 = YCTV 2 = Pay-Per-View 3 = Reg. TV	Unsigned Int
2	Event ID	Unsigned Int
3	Global Channel ID	Unsigned Int
4	Price (in Cents)	Unsigned Int
5	Start Time	HH:MM:SS
6	End Time	HH:MM:SS
7	Start Date	MM/DD/YY
8	End Date	MM/DD/YY
9	P-Icon	ASCIIZ
10	Name	ASCIIZ
11	Description	ASCIIZ

Table C shows an example Event.Dat data file. In particular, Table C shows two data streams corresponding to two event types. The first data stream identifies a YCTV™ event in the first field. The second field designates the event ID, which is 1234 in this example. The third field includes the global channel ID number two. The fourth field indicates the cost of 50 cents for this event. The fifth and sixth fields indicate the respective start and end times of 3:00 AM to 3:00 PM, respectively. The seventh and eighth fields show the corresponding start and end dates, designated as Aug. 25, 1993 and Aug. 27, 1993, respectively. Field nine indicates the P-icon set to PBS.PCX graphics file. Finally, fields ten and eleven indicate the name and description of the events selected, which in this case are Sesame Street™ and Barney™. The second data stream in the Event.Dat example shown in Table C includes analogous information for Terminator IV™, which is designated in field one as a pay-per-view event.

TABLE C

Event.Dat Example

```
1'1234'2'50'03:00:00'15:00:00'08/25/93'08/27/93'pbs.pcx'Sesame Street &
Barney's Sesame Street and Barney Abstract
2'1234'2'50'20:00:00'22:00:00'08/25/93'08/25/93't4.pcx 'Terminator 4'Ter-
minator 4 Abstract
```

The program control information signal and STTCIS can be formatted in a variety of ways and the on-screen menus can be produced in many different ways. For instance, if the program control information signal carries no menu format information, the menu format for creating the menus can be fixed in ROM at the set top terminal. This method allows the program control information signal to carry less information but has the least flexibility since the menu formats can not be changed without physically swapping the ROM.

In the preferred embodiment, the menu format information is stored at the set top terminal **220** in temporary memory either in a RAM, FLASH ROM, EEPROM or EPROM. This configuration provides the desired flexibility in the menu format while still limiting the amount of information needed to be communicated via the program control information signal. New menu format information can be sent via the program control information signal or the STTCIS to the set top terminals **220** each time there is a change to a menu.

Program access information for each program watched is stored at the set top terminal **220** until it is polled by the network controller **214** for information retrieval using the program control information signal or STTCIS. This information retrieval can be accomplished by using the polling request message and response formats, **920** and **920'** respectively, as shown, and FIGS. **7***a* and **7***b*, and described above, but any suitable polling request and response message format may be used to interrogate each set top terminal **220** sequentially, one by one. The set top terminals **220** are identified by a unique address and set top terminal identifier. It is preferred that the set top terminal **220** transmit information and messages to the network controller **214** only when given permission by the network controller **214** to do so.

Where, for example, specialty programs have been accessed since the previous poll, the set top terminal **220** is given permission to transmit a polling response **920'** in the form of a status report that includes any such access information. The network controller's control receiver (not shown) is tasked with the receipt of set top terminal polling responses or status reports. These status reports generally include information that allows the network controller **214** to track a subscriber's program access history.

FIG. **7***b* shows an example of frame format **920'** for the status reports received from the set top terminals **220** during the polling cycle. This frame format is identical to the polling request message format **920** and, as described, includes: (1) a leading flag **922'** at the beginning of the message, (2) an address field **924'**, (3) a subscriber region designation **926'**, (4) a set top terminal identifier **928'** that includes a polling command/response (or P/F) bit **930'**, (5) an information field **932'**, and (6) a trailing flag **934'** at the end of the message.

The information field **932'** remains variable in length so that the status of an indeterminate number of programs, represented at **931**, accessed can be included in the frame. In this way, the control message length of the polling request message is minimal since the network controller **214** does not transmit such access information. After a polling response by a given set top terminal **220**, however, the control message length increases in proportion to the number of programs accessed.

During transmission, the P/F bit is used to carry out the polling function. In particular, the P/F bit is set to a "1" position to command a polling response from the set top terminal **220** whose address is identified in the frame. The set top terminal **220** addressed must respond to the command in the same P/F bit also set to the "1" position. The response will include the number of programs accessed and their corresponding event identification numbers as shown in FIG. **7***b* at **931**. In cases where the set top terminal **220** has not accessed any programs since the previous polling cycle, the set top terminal **220** responds with the P/F bit set to "1" and the programs access block denoting zero programs accessed.

In between polling cycles, the program control information continues to supply the set top terminals **220** with menu

information. In the simplest embodiment, the menus remain fixed and only the text changes. Thus, the program control information signal can be limited to primarily text and a text generator can be employed in the set top terminal **220**. This simple embodiment keeps the cost of the set top terminal **220** low and limits the bandwidth necessary for the program control information. Another simple embodiment uses a separate channel full-time (large bandwidth) just for the menu information. This separate channel would facilitate the rapid downloading of new graphics for the system and would enhance response time when text and other data information needs to be changed.

In the preferred embodiment, the basic building blocks or templates of the on-screen menu displays will be stored in graphics memory consisting of nonvolatile RAM, FLASH ROM, EPROM, or preferably, EEPROM, as shown as **620** in FIG. **9***a*. Referring to FIG. **4**, with the information from the graphics memory **620**, the microprocessor **602**, graphics decompressor **622**, a text generator (not shown in FIG. **4**, but incorporated if necessary), and video combiner **624** will build a menu screen.

The memory files of the graphics memory are preferably categorized into three categories, background graphics **800**, logo graphics **820**, and menu and display graphics **850**, as shown in FIG. **9***a*.

The background graphics file **800** will store menu backgrounds such as: universal main menu backgrounds **804**, universal submenu backgrounds **808**, promo backgrounds **812** and custom menu formats **816**. The logo graphics file **820** will store any necessary logos such as: Your Choice TV™ logos **824**, Network logo files **828**, cable system logo files **832**, studio logo files **836**, and graphic elements file **840**. The menu display and cursor graphics file **850** will store menu display blocks **854** and cursor highlight overlays **858**, as well as any other miscellaneous files needed to build the menus.

Using this method of storing menus discussed above, the menus can be changed by reprogramming the graphics memory **620** of the set top terminal **220**. To revise the entire design of displayed menus, the network controller **214** or operations center **202** instructs the EEPROM **620** to be erased and reprogrammed with new menu templates. To change one menu format or logo, the network controller **214** or operations center **202** instructs Just the one location in memory to be erased and rewritten. Obviously, this menu reprogramming can also be done locally (at the set top terminal **220**) by a servicemen.

As shown in FIG. **9***a*, each memory subfile is further divided into various memory blocks. For example, the background graphics file **800** contains the universal main menu backgrounds **804**. The universal main menu backgrounds memory **804** includes memory units UM1 **860**, UM2 **862** and UM3 **863**. Similarly, the logo graphics file **820** and menu display and curser graphics file **850** contain individual subfile memory blocks (for example, studio logo file **836** has memory block SL1 **864**; menu display blocks **854** has memory menu display block MD1 **866**).

FIG. **9***b* shows the hierarchical storage of text transmitted from the cable headend **208**. Although text may be continuously transmitted with the video signals to set top terminals **220**, text may also be transmitted intermittently. In such a case, the text is stored in the set top terminal **220**. Preferably, the text is transmitted and stored in a compressed format using known techniques. Additionally, the text is preferably stored in graphics memory **620** within the set top terminal **220**.

Depending upon the use of the text, it will be stored in one of three portions of memory. Information sent with the text will either direct the text to a particular portion of memory, or include information as to the priority of text. The microprocessor **602**, part of the set top terminal hardware represented at block **880**, may then direct the text to the appropriate memory location for storage.

If the text is to be used frequently and over a long period of time a long term storage **875** will be used. If the text will be used for a shorter period of time (for example, a month), the text will be directed to an intermediate storage area **877**. If the text is to be used almost immediately, or for a short period of time (for example, within a few days) the text is directed to a short term storage area **879**. The microprocessor **602** locates the appropriate text required for a particular menu and retrieves it from the appropriate portion of memory **620**. The text is output from the graphics memory **620** to the text generator **621**. Text generated from the text generator **621** is thereafter directed to text/graphics video combiner **624**.

FIG. **9***c* shows the steps performed by the microprocessor **602** for creating a menu based upon a series of overlay screens. These instructions are stored in memory within the set top terminal **220** in a screens data file. The screens data file instructs the microprocessor **602** on the location of each graphics file on the screen. An example screens data file is shown in Table D, wherein the screens data file specifies menu data positioning in terms of, for example, x and y pixel positions, height and width, color codes and fonts. Alternatively, instructions or routines may be transmitted from the operations center **202** to be stored in memory within the individual set top terminals **220**.

TABLE D

```
~ The following data lines are for the main menu
~
~              Screen Type     Template File          Description
SCREEN         '@MAIN          'main menu.pcx         'Main Menu
~
~              Justify   X     Y     Ht    Wd    FColor  BColor  Font
STR POS        'Left     '165  '85   '30   '300  '27     '55     FUTUR14.GFT
STRING 'MAIN MENU
~
~              Justify   X     Y     Hght  Wdt
PCX POS        'LEFT     '190  '75   '200  '200
PCX example1.pcs
~
~              Justify   X     Y     Ht    Wd    FColor  BColor  Font          X     Y     Ht    Wd
ITEM POS       'Left     '120  '100  '20   '400  '15     '25     FUTUR12.GFT   '110  '90   '30   '420
ITEM'@YCTV'YOUR CHOICE TV
~
```

TABLE D-continued

~	Justify	X	Y	Ht	Wd	FColor	BColor	Font	X	Y	Ht	Wd
ITEM POS	'Left	'120	'200	'20	'400	'15	'25	FUTUR12.GFT	'110	'190	'30	'420
ITEM '@PPV'PAY-PER-VIEW HIT MOVIES												

As shown at block **878** in FIG. **9***c*, initially the microprocessor **602** instructs the tuner **603** to select a channel. The channel is decompressed, error corrected and decrypted, if necessary. If the video is to be reduced in size, so as to be placed within a video window, or is a split screen video window which must be enlarged, the video is scaled to the appropriate size. Additionally, the video may be required to be redirected to a portion of the television screen, accomplished by creating a series of offsets for each pixel location of the video.

Graphics must also be used to create a menu in most instances. As shown in block **882**, the microprocessor **602** must fetch a background file, a logo file, and a menu display and cursor file in most instances. Each of these files is decompressed **883**, and then combined, block **886**.

Similarly, the microprocessor **602** must fetch text, as shown in block **884**. Depending upon the memory location of the text, the microprocessor **602** will fetch the text from long-term, intermediate-term, or short-term storage, as described above. Based upon this memory retrieval, the text is generated, block **885**, and combined with the video (if any), with as many screens of a decompressed graphics as are necessary, and any text, block **886**. The image or portions of the image are stored in the video combiner (for example, combiner **624** of FIG. **4**) until all overlays are received. Thereafter, the entire image is sent, under direction of another routine, to be displayed on the television screen, as represented by display block **888**.

D. Reprogrammable Terminal for Suggesting Programs

1. Reprogramming the Set Top Terminal

In addition to all the features that the set top terminal **220** supports with internal programming resident at the set top, additional features may be added or existing features upgraded through remote reprogramming of the set top terminal **220**. In the preferred embodiment, the cable headend **208**, specifically the network controller **214**, performs the remote reprogramming of the set top terminal **220**. The cable headend **208** is able to reprogram the memory of the set top terminal **220**. With this capability the cable headend **208** can remotely upgrade most software or data stored in memory at the set top terminals **220**. For example, in the preferred embodiment, the cable headend **208** reprograms the menu format from time to time based upon special events or programming needs, such as Olympic telecasts, presidential elections, etc.

Set top terminal reprogramming preferably operates using the program control information portion of the transmitted signal and sending the appropriate data within the program control information. When reprogramming is to occur, the cable headend **208** will send an interruption sequence within the program control information format that informs the set top terminal **220** that reprogramming information is to follow. In an alternative embodiment, one channel is dedicated for the special programming needs of the set top terminal **220**.

Significant reprogramming of the set top terminals **220** will occur infrequently. However, the changing of color or menu formats will occur more often. In alternative embodiments, color changes to menus may be accomplished via the program control information itself and does not require reprogramming from the cable headend **208**.

Using the method of storing menus discussed above with reference to FIG. **9***a*, the menus can be changed by reprogramming the graphics memory **620** of the set top terminal **220**. There are at least two methods for reprogramming graphics memory. First, the instructions for generating the menus can be changed. These instructions are stored within the set top terminal **220** in a file (not shown in FIG. **9***a*). The instructions provide the microprocessor **602** with the location of each graphics file to be displayed on a menu screen (see Table D). Reprogramming the graphics file can be initiated by either sending an interrupt from the network controller **214** or attaching a 2–4 bit code to the program control information signal or the STTCIS indicating that instructions in graphics memory are going to be changed. The signal also designates either the file name to be changed, or alternatively, the memory locations in the graphics memory to be rewritten.

The new instructions could either be sent in the information field **932** (FIG. **7***a*) of the program control information signal or on a dedicated channel. Upon execution by the microprocessor **602**, the new instructions will be loaded into the appropriate files. Alternatively, the new instructions could be loaded into RAM or disc and later stored in the appropriate memory locations upon execution by the microprocessor **602**. With the new instructions stored in graphics memory, the microprocessor **602**, graphics decompressor, text generator (depicted at **623**, FIG. **9***b*) and video combiner can build new menu screens.

Alternatively, the graphics (e.g., background graphics **800**, icons, logo's **820**, menu display blocks **854**, cursor highlight overlays **858**, etc.) can be changed directly by accessing and rewriting the files in graphics memory **620**. For example, to revise the entire design of displayed menus, the network controller **214** or operations center **202** instructs the memory to be erased and reprogrammed with new menu templates (or background graphics file). In the preferred embodiment, the menu format information of the on screen menu displays is stored at the set top terminal **220** in graphics memory **620** consisting of RAM, ROM, EPROM, or preferably EEPROM. To change menu formats, logos, icons, etc., directly, the network controller **214** or operations center **202** instructs the appropriate memory locations to be erased and rewritten with the new menu data using memory location identifiers in the instructions sent in either the program control information signal or STTCIS. New menu format information can be sent via the program control information signal or the STTCIS to the set top terminals **220** each time a change in menus occurs.

Obviously, this type of remote menu reprogramming can also be done locally (at the set top terminal **220**) by loading an external cartridge into the set top terminal **220** containing reprogramming instructions with the graphics changes.

In addition to menu reprogramming, the software programs resident at the set top terminal may be reprogrammed. Generally, to reprogram software programs resident at the set top terminal **220**, the network controller **214** sends an interruption command via the program control information signal or STTCIS (hereinafter designated "program control information signal") informing the set top terminal **220** that reprogramming information will follow. The program con-

trol information signal also contains memory address locations or instruction lines where reprogramming will occur. Preferably, both the interrupt and memory address locations are included in the data portion of the program control information signal framework. The data portion of the program control information signal will also include the program changes.

Interpreting the reprogramming software resident at the set top terminal **220**, the microprocessor **602** will instruct that the reprogramming changes be stored initially in volatile memory such as RAM. After locating the appropriate memory locations or instruction lines, the microprocessor **602** at the set top terminal **220** reads the frames of program control information received and writes the programming changes to the appropriate memory locations.

There are at least two alternative embodiments for implementing the reprogramming of the set top terminal **220** discussed above. The preferred embodiment is shown in FIG. **10***a*. In this embodiment, the software with reprogramming instructions **1100** is stored in a nonvolatile storage chip (EPROM) **1102** at the set top terminal **220**. Since this program is resident in nonvolatile storage, it will be able to continue to execute after a power failure. The current executable program version n is stored on FLASH ROM in storage sectors 0 to x.

Reprogramming of the set top executable program can occur at any time. Reprogramming may commence after the sending of an interruption message via the program control information signal informing the set top that reprogramming will follow. The network controller **214** will follow the interruption message with the new program version n+1 in the data portion of the program control information signal.

The microprocessor **602** recognizes and interprets the interrupt message and directs the execution of the reprogramming software **1100** stored in EPROM. The reprogramming software **1100** instructs the construction of a file in RAM **1104** to house the new program version n+1, as shown at **1106**, and the microprocessor **602** will interpret the program control information signal and direct that the new program version n+1 **1106** be stored in RAM **1104**, as shown.

Once the new program version n+1 **1106** is completely loaded in RAM **1104**, as indicated by reception of all data packets, the process of reprogramming the FLASH ROM **1108** begins. In this embodiment, the new program version n+1 **1106** will be loaded into the same FLASH ROM **1108** as the old program version n **1110**. The microprocessor **602** will direct the new program version n+1 **1106** to overwrite the old program version n **1110**. The old program version n can be rewritten with the new program version n+1 by initially rewriting all locations in the appropriate sector of FLASH ROM **1108** to zero. This sector of memory is then erased and the sector is rewritten with the data in the new executable program version n+1 **1106**. This process continues sector-by-sector until the new program is completely transferred and stored in the memory locations of FLASH ROM **1108**. Upon completion of loading the new program version n+1 into the FLASH ROM **1108**, the set top terminal **220** will be reset. After resetting, the set top terminal **220** will commence operating off of the new executable program version n+1.

If there is a failure during the resetting process, the set top terminal **220** will have to send a message to the network controller **214** requesting that the controller resend another copy of the new program version n+1. The reprogramming process will then begin anew, as described in the preceding paragraphs.

Alternatively, reprogramming can occur with the configuration shown in FIG. **10***b*. The process for reprogramming in this embodiment is similar to that depicted in FIG. **10***a* and, therefore, is commonly numbered except for different steps or features. However, a current program version n **1110** remains in FLASH ROM (i.e., is not overwritten with the new version n+1 throughout the process, wherein the new current version will overwrite an old program version n−1 **1112**. By not overwriting the current program version n **1110**, the particular application being changed can continue to operate in normal fashion in the event of failure. The set top terminal **220** continues to run off the program version n **1110** until the new executable program n+1 **1106** is completely loaded in the FLASH ROM **1108**

As in the embodiment described above with reference to FIG. **10***a*, the network controller **214** sends an interrupt message via the program control information signal to signify that reprogramming will commence. The new program version n+1 **1106** is sent from the network controller **214**, or other remote location, in the data frame within the program control information signal.

The microprocessor **602** recognizes and interprets the interrupt message and directs the execution of the reprogramming software **1102**. Once the reprogramming software **1102** recognizes the file name of the new program version n+1 **1106**, the software instructs the construction of a file in RAM to house the new program version n+1 **1106**. The new program version n+1 **1106** is then loaded into RAM **1104**. Once all of the packets of the new executable version n+1 **1106** are completely loaded in RAM **1104**, the process of reprogramming the FLASH ROM **1108** begins. In particular, an instruction commands the initiation of loading the new program version into the sectors X to X plus N of the FLASH ROM **1108**. Each sector of memory comprising the old program version n−1 **1112** in the FLASH ROM **1108** is rewritten with the new data in the new program version n+1 **1106**.

If a single FLASH ROM does not have enough memory capacity to store both the current program version n **1110** and new program version, the new program version **1106** can be loaded into a second FLASH ROM.

Upon completion of loading of the new executable **1106** into FLASH ROM **1108**, the microprocessor **602** will command that the set top terminal **220** be reset. Resetting the set top terminal **220** will cause the old program version n **1110** to be flushed out, causing the new executable program version n+1 **1106** to run.

As an alternative to resetting the entire set top terminal program, the set top executable code can be written modularly, with a main module and a series of sub-modules. With this code structure, the set top program would not necessarily need to be entirely reset when replacement code is provided to the set top. Instead, individual sub-modules may be selectively replaced. Only when a replacement main module is sent, is resetting of the set top program necessary.

The instructions for reprogramming (overwriting) are contained in the main module, which calls sub-modules of code. The sub-modules are not active until called by the main module. During the calling procedure, a check for the existence of replacement code (new code) for that sub-module is performed. This check may be performed either by a physical check of a particular memory location, the setting of a variable in a particular memory location or other method. If replacement code is found for the called sub-module, the replacement code will be run. After a series of error checks on the viability of the replacement code, instructions are sent for the replacement code to overwrite the called upon sub-module in the sub-module's memory location.

In another embodiment, the set top receives a reprogramming signal from a remote location. The reprogramming signal can include a command informing the set top terminal that reprogramming is to commence such as an interrupt command. The reprogram signal may also include frames having a control portion and a data portion. The reprogramming signal designates the memory locations to be updated in a control portion of the signal frame and provides program changes, updated changes, graphics instructions or graphics data in the data portion of the signal frame.

The received reprogramming signal is processed by the set top terminal. Changes in the reprogramming signal are read or interpreted, stored and then transferred. The set top terminal can be reset so that the set top terminal operates using the changes. During the reprogramming process, the set top terminal can continue to operate as normal using a stored operational program.

Although the embodiments describe specific methods for accomplishing reprogramming of the set top terminal **220**, those of ordinary skill in the art will recognize that the reprogramming methodology is not limited to those embodiments described above but can also consist of embodiments employing different types and configurations of memory devices. Those skilled in that art will also recognize that the reprogramming methodology is not dependent on receiving new programs or graphic files from the network controller **214** or operations center **202** but the new programs or graphic files could also be generated at either the set top terminal **220** or other remote locations.

2. Suggesting Programs Description

a. Overview

Referring to FIGS. **11***a–e*, **12***a–e*, **13***a* and **13***b* and **14**, the terminal's ability to assist a subscriber in choosing channels or programs for viewing is presented. There are a variety of methods in which a set top terminal **220** can suggest a channel or program for viewing. These methods can be loosely categorized into three groups: (1) responsive methods, (2) intelligent methods and (3) methods which integrate both responsive and intelligent methodologies.

All of the methodologies for suggesting programs have in common the provision of gathering data that is representative of subscriber preferences. The microprocessor **602** will interpret, format and store this data in memory at the set top terminal **220**. Alternatively, the subscriber specific data can be stored in memory at the network controller **214**. Using program scheduling and descriptive information received from the operations center **202** or network controller **214** in either the program control Information signal or STTCIS, and the subscriber specific data, the set top terminal **220** can select programs suited to subscriber viewing preferences based on one of the analytical methodologies described below. These programs can be displayed on the television screen for viewer selection. Once the subscriber has indicated a selection by using, for example, a remote control **900** utilizing cursor movement, the microprocessor **602** at the set top terminal **220** can match the subscriber selection to the program and direct the set top terminal **220** to tune to the selected program.

With memory and a microprocessor **602** built into the set top terminal **220**, "intelligent" methods of determining a subscribers programming preference are possible. By analyzing a subscribers past behavior, the set top terminal **220** can literally "learn" to suggest appropriate programming or channels for a viewer. To accomplish this analysis, clues as to the subscribers behavioral pattern must be saved in the set top terminals memory. These clues, such as programs watched and time periods of television viewing, are analyzed as necessary to develop a profile of the viewer. Most of this information is gathered and stored by the set top terminal **220** unbeknownst to the subscriber. A simple example is the set top terminal **220** "learning" which channels are a subscriber's favorite channels. A simple learning process would involve the set top terminal **220** determining which channels were the most often watched by the subscriber and then assuming that those channels are the subscriber's favorite channels.

More sophisticated learning algorithms can be implemented in the set top terminals **220** via expert systems, for example. These expert systems adapt to changing viewer preferences over time and change the corresponding subscriber profile.

Alternatively, a responsive method of suggesting programs or channels may be used. Using the subscriber interface and menu generation, program selections can be responsive to information gathered from inquiries about the particular subscriber or from subscriber selected entries descriptive of preferred programming.

Methods for suggesting programs or channels can integrate the use of the set top terminal's intelligence and information gathering potential. In order to combine the methods, "weights" are generally assigned to various indicators which assist in determining what channel or program the viewer desires. Following evaluation of the weighted information, program or channel suggestions are made to the viewer. For example, the weights attributed to different preference indicators can be accumulated and processed resulting in a selection signal which could be matched to suggested programming through the use of logic networks.

While each of the suggestive embodiments described below are set forth in reference to a set top terminal, numerous hardware variations are possible, including using the embodiments in video rental equipment such as a kiosk.

b. Responsive Embodiment Using Program Abstracts

In the preferred "responsive" embodiment (depicted in FIGS. **11***a–e*), program abstracts are used to facilitate the suggestion of programs to subscribers. The abstracts are preferably created either at the network controller **214** or the operations center **202**. They would be similar in text and format to those used to describe movies currently listed in common TV movie guides. Each abstract contains language descriptive of the particular program's contents. These abstracts are preferably stored in a database either at the network controller **214** or set top terminal **220**.

If the program abstract database is stored locally at the set top terminal **220**, it can reside in either ROM, EPROM or on disc. If stored at the set top terminal **220**, the program abstract database will preferably initially be sent from the network- controller **214** or operations center **202** on the program control information signal or on a dedicated channel. In this embodiment, updates and changes to the program abstract database can be accomplished as mentioned above in the description regarding reprogramming the graphics memory.

In this embodiment, the program control information is received by the set top terminal **220** and integrated with menu details stored in graphics memory. With this integrated information, the microprocessor, graphics decompressor, text generator and video combiner will generate a main menu screen and series of submenu screens. The microprocessor **602** directs the displaying of the menu screens to the subscriber. The menu screens, as described in more detail below, comprise a graphical display of search criteria. Each particular search criteria has a list of preference entries.

The subscriber will provide responses to the set top terminal **220** by selecting preference entries indicative of the

subscriber's programming preferences. For example, the subscriber can utilize a remote control **900** to facilitate the selection of preference entries by touring through the menus with the assistance of a cursor.

Each subscriber entry will then be mapped into a set of key words selected from a downloaded thesaurus. Alternatively, the subscriber entries could be used as the key words. The key words are then used by the microprocessor **602** to search the program abstract database. If the program abstract database is at the network controller **214**, the set top terminal **220** will have to send the key words to the network controller **214**. The microprocessor **602** will then select one or more programs to suggest to the subscriber based on the results of the abstract search. These suggested programs will then be displayed on the menu for viewer selection.

More specifically, this embodiment can be described with reference to the menu screens in FIGS. **11***a*–**11***e*. In this embodiment, as shown in the main menu **1130** depicted in FIG. **11***a*, a list of possible search criteria (hereinafter criteria) **1132**, including mood, type, category/genre, actor, time, year preference and standard rating, are provided to assist in the search of selected program suggestions. The viewer has the option to select as few or as many of the criteria **1132** as desired, with the understanding that the more data provided, the more selective the resulting list of suggested programs. The subscriber can select a desired criteria **1132** by depressing buttons either on a remote portable controller or on the set top terminal **220** to move a cursor or highlight bar on the TV screen.

Following selection of a criteria on the main menu, the viewer may move through one or more submenu screens from which to choose particular entries Indicative of programming preferences. As mentioned above, the viewer may choose as few or as many criteria as desired. One criteria depicted in the main menu **1130** is the mood criteria **1134**. Upon selection by the viewer of the mood criteria **1134**, a submenu **1136** will appear on the screen, depicted in FIG. **11***b*. The mood submenu **1136** allows the viewer to pick from a list of subjective moods **1138**, such as SERIOUS, THOUGHTFUL, LIGHT, TIRED, SAD, etc. Preferably the viewer will use a cursor or highlight bar to scroll down the list of subjective moods and select the preference entries desired by clicking on a select button on either the remote or on the set top terminal **220**. The viewer can select one or more of these moods with the exception that the program will not allow the selection of what it determines to be mutually exclusive moods (e.g., HAPPY and SAD). This is accomplished by locking out a mood selection when its opposite has already been chosen.

The selected moods are cross referenced (or mapped) with a list of key words from a downloadable thesaurus table stored preferably in either ROM, EPROM or on disc at the set top terminal **220**. The key words will then be used to directly search the abstracts in the program abstract database (not shown).

Referring back to FIG. **11***a*, the viewer can select the program TYPE criteria **1144** in which to further distinguish the programs by program preference. Upon selection of the TYPE criteria **1144**, the TYPE submenu **1146**, as shown in FIG. **11***c*, will appear on the screen. This submenu **1146** consists of a number of descriptive adjectives **1148** that will preferably be used directly as key words to search the abstracts resident in the program database. The viewer can select one or more adjectives **1148** to make the search more selective.

Again, referring back to FIG. **11***a*, if the viewer selects the standard category/genre criteria **1152** shown in the main menu, the category/genre submenu **1154** will appear as shown in FIG. **11***d*, allowing the viewer to qualify a search to one or more of the program categories downloaded to the database (example: MOVIE, DRAMA, CHILDREN, etc.).

FIG. **11***a* shows that a viewer can also refine a search by selecting a favorite actor **1158**. Selecting the actor criteria **1158** will allow a viewer to fill in a name entry window **1160**. The name entry window **1160** is limited to six letters in the preferred embodiment with the cursor on the first location, and a name is entered sequentially one letter at a time. The channel up/down key, either on the remote or set top terminal **220**, allows the viewer to scroll forward and backward, respectively, through the alphabet. When the desired letter has been chosen and entered, the viewer can use the volume up/down key to move left and right in the name through all the letter positions, until the actor's name has been fully or partially entered. The search tool will search for all the occurrences of the letters entered. If the name has been fully entered, a precise search of the program abstract database will be conducted for that name. If the name has been only partially entered, the search tool will look for a closest match to the partially entered name.

The TIME criteria **1162** allows a viewer to choose the preferred time of day, the preferred duration (in 30 minute increments up to 2 hours), and the preferred day of the week. An alternative embodiment would allow the viewer to select up to X hour time periods for a certain day in which to search.

The YEAR criteria **1164** preferably comprises groupings of years. For example, the current year and programs five to ten years old, ten to 20 years old, 20 to 40 years old, and older than 40 years. If desired, the viewer can highlight more than one group of years. If the viewer does not highlight any grouping of years, then all years are assumed desired by the viewer.

The STANDARD RATING criteria **1166** allows the viewer to qualify the search to one or more of the MPAA ratings (G, PG, PG-13, R, NC-17).

In alternative embodiments, the actors, time, years, ratings, etc., can also be selected through the provision of submenus similar to those depicted in FIGS. **11***b*–**11***d*.

The preferred embodiment also provides for "negative" searches. In this type of search, words descriptive of a program type of no interest to the viewer can either be used directly as key words or mapped into key words in the downloaded thesaurus. If the key words are found in a program during a search of the database, the program is automatically excluded from the selection list. For example, if the viewer does not desire to view any X or R rated movies, the viewer can simply choose to exclude movies rated as X or R by selecting these ratings on the main menu.

In this embodiment, after the viewer has selected as many of the entries as desired, and then hits the "go" button or alternatively selects by cursor or highlight a "go" menu item on the menu screen, the corresponding search will commence. Any typical search tool can be used to search the program abstract database. For example, a Boolean search can be used to scan the database of textual entries and retrieve the textual entries that satisfy the Boolean search. The programs which meet the search criteria (contain the key words corresponding to entries) selected by the viewer will be counted and the count displayed in the "No. Selections" box **1170** in the upper right hand corner of each of the screens **1130**, **1136**, **1146**, **1154** of FIGS. **11***a* through **11***d*.

If the viewer desires to view a list of all of these selections and/or corresponding abstracts, the viewer may select the VIEW option **1172** in the main menu **1130**. Upon selection

of the view option, the microprocessor **602** instructs the selection list menu **1174**, as shown in FIG. **11***e*, to be displayed on the screen. The viewer can scroll down the list by using the cursor and select the desired movie by clicking on the desired program indicated by cursor or highlight. In FIG. **11***e*, for example, the viewer has selected the John Wayne movie GREEN BERETS. After making the selection, the program is displayed on the screen, but if there are too many or too few programs listed, or the viewer decides not to watch any of the selected programs, the viewer has the option of returning to the main menu by selecting the RETURN TO MAIN MENU box **1176**. Once the main menu screen **1130** is displayed, the viewer may choose to begin a completely new search, or alternatively, may refine the prior search. If the viewer chooses to perform a refined search, the viewer can access the various submenus and choose further preference entries resulting in a more precise search and fewer number of program selections.

It is understood that this embodiment of searching program abstract databases can be combined with the other methods described below, including viewer profile data and most often watched information. For example, different criteria can be assigned different weights (weighting the criteria's preference entries). Then based on an evaluation of the weighted preference entries, only those programs satisfying a minimum weighted index would show up as a selection to be suggested to the viewer.

Alternatively, program indicators can be generated and used in assigning a weight number to programs. The weight a program is assigned could be based on either most watched program information, favorite channel, or personal profile as described below. The list of suggested entries resulting from the program abstract search methodology described above could then be further refined and reduced based on the results of accumulating the weighted indicators corresponding to the programs listed. For example, weighted numbers can be assigned to programs based primarily on the category of the program. The weighted numbers are used by the system to refine the search. Those programs suggested from the program abstract search can then be prioritized and either displayed in prioritized order or further refined by deleting programs not satisfying a minimum weight threshold thereby reducing the list of suggested programs displayed to the viewer. The refined list is then displayed to the viewer.

c. Other Program Suggestion Embodiments

In another "Responsive" embodiment, a favorite channel list can be established based on responses to inquiries. In this embodiment menus can be used to query a subscriber and allow the subscriber to select eight favorite channels for later display. FIG. **12***a* depicts a menu **1180**, the Broadcast TV Menu, with a favorite channels category of program menus **1182** for selection. FIG. **12***b* shows an example of a favorite channel program submenu **1184** being displayed. Although a variety of types of information can be requested, mood questions and inquiries on personal information about a subscriber are preferred for this responsive method of selecting programs for viewers.

In another embodiment, both favorite channels and often watched channels features can be utilized during menu selection. As described above, favorite channels can be stored in memory in the set top terminal **220** for later use. In addition to favorite channels, the broadcast TV menu **1180**, has a separate often watched channels category **1186** which allows the subscriber or the set top terminal **220** in a learning mode to choose eight additional channels for display.

In another embodiment, in a manner similar to learning the most often watched channels of the subscriber, the terminal can also determine the most often watched programs by the subscriber. After developing (or learning) a list of popular shows or querying the subscriber for a list of popular shows the terminal can display a customized submenu allowing the subscriber to choose one of the suggested popular shows available for viewing. In order to display suggested programs that are available, the set top terminal **220** must cross reference the available programs with the viewers choices. This can be accomplished using the program control information signal. After the cross reference, a popular show submenu similar to the favorite channel submenu shown in FIG. **12***b* may be displayed on the television or monitor.

In one embodiment, a sophisticated program viewing suggestion feature is available as an optional feature for the subscriber. This feature gives the indecisive viewer or lazy viewer specific suggestions as to which programs the viewer should watch. The set top terminal **220** uses a combination of intelligent and responsive methodologies along with a matching algorithm to accomplish the program viewing suggestion feature.

In order for the set top terminal **220** to make decisions on which programs the subscriber should watch, the terminal creates a personal profile for the particular viewer. Using the data in the particular viewer's personal profile, subscriber mood information and the television program information available in the program control information signal, the set top terminal **220** is able to select a group of programs which the particular viewer is most likely to watch.

Specifically, the set top terminal **220** builds a personal profile for each viewer and stores the information in a memory file by viewer name. To build a personal profile, the viewer answers a series of questions presented on a series of menu screens. These personal profile screens request the viewer to input information such as name, sex, age, place of birth, place of lower school education, employment type, level of education, amount of television program viewing per week, and the number of shows in particular categories that the viewer watches in a given week such as, sports, movies, documentaries, sitcoms, etc. A universal remote control **900** with alpha-numeric buttons may be used to assist in entering the demographic data. Any subscriber demographic information which will assist the set top terminal **220** in suggesting television programs to the viewer may be used. This raw data must be interpreted, formatted, and stored in memory by the set top terminal **220**. Preferably the gathered data is processed and stored in a relational database. Once a personal profile has been created (in a particular set top terminal **220**), it can be indefinitely stored in nonvolatile memory.

Alternatively, the personal profile information may be electronically transmitted to the set top terminal **220** from a remote location such as the cable headend **208** or billing site. In some cable systems, personal profile information is stored at the billing site. This information can be electronically transmitted via phone or cable to the set top terminal **220**. The set top terminal **220** must receive the data, interpret the data, and format the data for storage in a database in memory, as well as for later use.

A selection at the home menu screen **1010** (FIG. **8**) activates the program selection feature. Following activation of the program selection feature, as shown in FIGS. **12***c*–**12***e*, the set top terminal **220** will present the viewer with a series of brief questions to determine the viewer's mood at that particular time. For example, the first mood question screen **1190** may ask the viewer to select whether a short (30 minute), medium (30–60 minute), or long (60

plus minute) program selection is desired, as shown in FIG. **12***c*. The second mood question screen **1192** requests the viewer to select between a serious program, a thoughtful program, or a light program, as shown in FIG. **12***d*. And the third mood question screen **1194** requests whether the user desires a passive program or an active program, as shown in FIG. **12***e*. The viewer makes a selection in each question menu utilizing the cursor movement keys and "go" button on his remote control **900**. A variety of other mood questions are possible such as the fatigue level of the viewer, whether the viewer is in the mood for older programming, etc.

After the viewer has responded to the mood question menus which determine the viewer's mood, the set top terminal **220** uses a matching algorithm to find the best programming matches for the viewer and displays an offering of several suggested programs to the viewer (three or more programs are preferred). The matching algorithm compares the viewer profile data, mood data, and most often watched program information (if available, or favorite program information) with information about the program derived from the program control information (or STTCIS) signal, such as show category, description type, length, etc. Using the personal profile information and mood questions suggested above, the following types of outcomes are possible.

If the set top terminal **220** is presented with a young female viewer, educated in Boston who watches sitcoms on a regular basis, and desires a short, light, passive program, a match might be found with the 30-minute sitcom Cheers, the sitcom Designing Women, or Murphy Brown. Taking another example, for a middle-aged male viewer from the Boston area, wishing a longer length, light, passive program, the New England Patriots Football™ game, the Boston Red Sox Baseball™ game or a science fiction movie might be suggested.

With this program selection feature, the set top terminal **220** can intelligently assist the specific viewer in selecting a television program from among hundreds of available choices. The viewer is preferably offered a graphic menu of suggested program choices from which to choose.

Instead of the set top terminal **220** requiring an input of personal profile information, the terminal may also "learn" personal profile information. A subscriber's viewing habits may be "learned" by maintaining historical data on the subscriber and analyzing this data. The historical data may include the channels (or networks) and types of programs the viewer has most frequently watched, time of viewing, duration of viewing, duration of programs viewed etc. This information must then be analyzed to profile the viewer.

In the preferred "learning" embodiment, the personal profile information is time and date sensitive in that program indicators will be different depending on the date and time of day. For example, a working male with a high school education who has been active in sports or enjoys sporting events might have a heavily weighted sport program indicator during the day on the weekend days but a heavy comedy program indicator in the late evenings on weekdays. His profile might show light programming on working day evenings. After analysis, the indicators can be communicated to the weighing algorithm and the matching algorithm which selects the suggested television programs. The matching algorithm may be implemented through the use of a logic network. The logic network includes a signal detector which could be used for storing and accumulating the weighted indicators. Based on the accumulated weighted indicators, the logic network could provide a selection signal for use in matching to a suggested program.

Examining FIG. **13***a*, two gathering steps are required, personal information and mood information gathering, denoted at blocks **1202**, **1206**, respectively. As described above, there are several methods in which this information may be gathered. Once it is gathered, it may be stored (and updated as necessary) for future use. The indicators may be newly calculated for each subscriber entry into the program selection system. Alternatively, at least each time the information gathered is changed or updated, the information must be reinterpreted and converted into preferred program indicators, blocks **1212**, **1214**.

Program indicators should at a minimum indicate the type of programming to be suggested. To accomplish this, television programs are divided into program categories preferably the same or similar to those categories used for the menu sequence for menu selection of programs (described in the detailed description of the set top terminal **220**). For example, sports, comedy, news, documentaries, and hit movies may be program categories. Although a variety of program indicators can be used, the preferred method is to assign a weight to each program category. Thus, a database of information can be analyzed and weights can be assigned to the program categories such as sports (**40**), comedy (**30**), news (**20**), documentaries (**5**), hit movies (**5**).

Using the example shown in FIG. **13***a*, a set of preferred program indicators consisting of categories and weights are assigned based on the personal profile data. A second set of preferred program indicators are assigned based upon the mood data. These two sets of preferred program indicators would then be analyzed and weighted, block **1218**, prior to entering the matching algorithm, block **1222**.

In a specific example, a subscribers updated personal profile might indicate: sports (**40**), comedy (**30**), news (**20**), documentaries (**5**), hit movies (**5**); The subscribers mood might indicate: sports (**40**), comedy (**20**), news (**5**), documentaries (**5**), hit movies (**30**). The weight given to mood might be a factor of three while the weight given to personal profile might be a factor of one, since mood information is the more recent and important information. The weighted indicators passed onto the matching algorithm would be three times the mood indicators plus one times the personal profile indicators, namely: sports (**160**), comedy (**90**), news (**35**), documentaries (**20**), hit movies (**95**). Therefore, the matching algorithm will focus on sports but also provide selections in hit movies and comedy. The matching algorithm is unlikely to suggest any programs in the news or documentaries categories.

The more areas of information that are gathered and used for indicators, the more weighing factors and calculations that are necessary by the weighing algorithm. Other more sophisticated methods of weighing the importance of the data may be used.

The matching algorithm receives program control signal information, block **1226**, and extracts needed information therefrom, block **1230**, then matches programs with subscribers. The matching algorithm involves three primary steps: (1) eliminating programs that are out of the subscribers desired time frame, (2) eliminating programs in program categories that the subscriber is not interested in watching, and (3) determining priority of desired programs. Finally, the selected programs are displayed, block **1234**.

The first two steps eliminate the programs in which the viewer has shown no interest. The first step eliminates programs out of time sequence (current start time or next half hour) and outside the desired length (e.g. .30–60 minutes). With two or three hundred channels in the program delivery system this would reduce the program choices by approximately two thirds to roughly **100** programs.

The next step eliminates programs in program categories that have received the lower program indicator numbers. For instance, in the example above the news and documentaries program category received low indicator numbers. Programs in these categories are eliminated. This generally reduces the number of programs by at least 40 percent from about 100 to 60 or so programs.

The next step is to assign weight numbers to each program. Weight numbers are assigned to programs based primarily on the category of the program. If programs are in two program categories (e.g. hit movie and comedy) an average is taken of the two assigned weight numbers for each program category. The weighted numbers are used by the system as the subscribers selection criteria.

Having weighted the programs, the number of relevant programs can be reduced by examination of the weighted numbers. It is preferred that ultimately the hundreds of available television programs be reduced to the twenty or so programs most likely to be viewed by the subscriber.

A variety of methods can be used to determine the final priority of the programs. Where using certain selection methodologies, programs in the same category have the same weight, other finer methods of differentiation may be used. For example, programs receiving the same weight can be further distinguished by network. Programs on the major networks may take priority over programs on smaller networks. Programs that are on networks that the viewer watches more frequently can be given priority over networks less frequently watched. Another example of differentiation is that newer programs (more recently filmed programs) are given priority over older programs. Finer methods of gradation may be accomplished by refining the weighted numbers assigned to the programs or through simple reprioritizing of programs on the short list of twenty programs.

Following the matching, the programs may be displayed on a menu screen generated as described earlier. A signal identifying the suggested programs is generated to assist in the menu generation process. It is preferred that 4 to 8 selections are shown on a menu screen. If none of these selections are satisfactory to the viewer, then a second and third menu screen of program choices may be displayed. Upon selection of a program the set top terminal tunes or switches the viewer to the chosen program.

In an alternative embodiment, as shown in FIG. **13***b* (commonly numbered with FIG. **13***a* except for block **1238**), program watched information, block **1238**, can be used directly in the matching algorithm. One way in which the program watched information can be used directly by the matching algorithm is by determining and using the often watched information in the final decision step. After the matching algorithm has ordered a selection of programs for the viewer the often watched program list may be used to modify or refine the final program list prior to display. For example, the matching algorithm may choose 20 of 100 programs and order the programs 1 through 20 from the most likely to the least likely viewer choices. This ordered list of 20 is compared with the most often watched program list.

A simple use of the list would be to compare between the ordered list of 20 selected programs and the often watched list, to locate the matches or closely related programs and increase the order number of those programs or "bump up" those programs on the ordered list. A second method would be to increase the located programs weighted number before ordering the 20 programs according to weight. In either case, the effect is that the often watched programs are shifted to a higher priority on the list of twenty programs and ultimately may be placed on the first suggested menu screen of programs. A third method of using the information would be to locate any often watched program existing within the 100 current programs and assign each located program a high weighted value before the matching algorithm calculations described above are performed.

In an alternative embodiment, additional coded information is provided to the set top terminal **220** via the program control information signal to assist with the program selection. For example, demographic codes for each program may be sent via the program control information signal. Additional bits could be added to the frame shown in FIG. **7***a* to facilitate the communications of the code from the controller to the set top terminal **220**. A code table could be stored in memory at the network controller **214**. Each code would correspond to an attribute. In this embodiment, a program database would comprise a listing of hundreds of programs along with codes which provide descriptive attributes pertaining to the program. These attributes could be similar to the entries already described above in the menus of FIGS. **11***a*–**11***e*. The demographic codes describe the subscriber demographics most likely to match with the program. Thus, a comparison of the stored demographics in the personal profile and the demographic codes will render a list of preferred programs for the subscriber. Those skilled in the art will realize that a variety of information may be sent by code via the program control information signal.

Although the embodiments specifically describe the use of several sources of information to suggest programs to the subscriber (i.e. mood and personal profile), those skilled in the art will realize that any one source of information or many more sources may be used. Those skilled in the art will also realize that this program suggestion methodology is not limited to the specifics types of information described but can be used with various types of information that indicate a viewer preference.

Using these methodology, it is even possible for the set top terminal **220** to suggest programs for two viewers. By using two sets of viewer profile information, the matching algorithm can find the best match for joint viewing. For example, the set top terminal **220** can suggest programs for a couple watching television simultaneously. The terminal would use the data stored in memory for each of the two viewers and determine the couples program selections which are similar or overlap. This method of program selection can resolve disputes between viewers.

After a subscriber selects a suggested program from a menu screen or list of the selection feature, the microprocessor **602** electronically informs the tuning and decompressing hardware of the bandwidth location of the appropriate program (within the television program signal). Armed with this information the set top terminal **220** is able to display the program for the viewer on a television, monitor or similar device. Alternatively, a preview menu screen **1142** as shown in FIG. **14** may be shown to the subscriber which describes and previews the program selection. The preview menu screens may include live video or stills **1144** depicting the program selected.

The terms and descriptions used herein are set forth by way of illustration only and are not meant as limitations. Those skilled in the art will recognize that numerous variations are possible within the spirit and scope of the invention as defined in the following claims.

What is claimed is:

1. A reprogrammable set top terminal for a television delivery system capable of being remotely reprogrammed wherein stored information may be upgraded using changes

contained in a reprogramming signal, the reprogrammable set top terminal comprising:

a means for receiving the reprogramming signal from a remote location wherein the reprogramming signal comprises a command informing the set top terminal that reprogramming is to commence followed by changes;

a means, connected to the receiving means, for interpreting the changes in the reprogramming signal;

a first means, connected to the interpreting means, for storing the interpreted changes;

a second means for storing information;

a means, operably connected to the receiving means and first and second storing means, for processing the received reprogramming signal whereby the processing means instructs the transfer of the stored interpreted changes from the first storing means to the second storing means, so that the set top terminal operates using the interpreted changes.

2. The reprogrammable set top terminal of claim 1 wherein the first means for storing comprises random access memory and wherein the second means for storing comprises FLASH read/write memory.

3. The reprogrammable set top terminal in claim 1 wherein the processing means comprises reprogramming instructions, and whereby the reprogramming instructions direct the reprogramming of the set top terminal.

4. The reprogrammable set top terminal of claim 3 wherein the processing means further comprises erasable programmable read only memory, whereby the reprogramming instructions are stored in the erasable programmable read only memory so that the reprogramming instructions will execute after a system failure.

5. The reprogrammable set top terminal of claim 3 wherein the processing means further comprises FLASH read/write memory, whereby the reprogramming instructions are stored in the FLASH read/write memory.

6. The reprogrammable set top terminal of claim 1 further comprising a third means for storing an operational program, whereby the set top terminal continues to function during the processing of the reprogramming signal using the stored operational program.

7. The reprogrammable set top terminal of claim 6 wherein the third storage means comprises a FLASH read/write memory.

8. The reprogrammable set top terminal of claim 1 wherein the means for receiving a reprogramming signal further comprises means for receiving graphics instructions and wherein the changes include graphics instructions.

9. The reprogrammable set top terminal of claim 1 wherein the means for receiving a reprogramming signal further comprises means for receiving graphics data and wherein the changes include graphics data.

10. The reprogrammable set top terminal of claim 1, wherein the stored information includes a current program version n and a past program version n−1, and wherein the interpreted changes provide a new program n+1, the means for processing further comprising:

means for overwriting the past program version n−1 with the new program n+1, without overwriting the current program version n; and

means for resetting the set top terminal so that the set top terminal operates using the new program n+1 rather than the current program version n.

11. The reprogrammable set top terminal of claim 1, wherein the means for receiving a reprogramming signal also receives menu changes, and wherein the changes include menu changes.

12. The reprogrammable set top terminal of claim 11, wherein the menu changes include graphics data.

13. The reprogrammable set top terminal of claim 1, wherein the processing means comprises means for selecting a television program to suggest to a subscriber.

14. A method for updating a set top terminal having volatile and nonvolatile memory containing memory locations for use in a television delivery system, the method comprising the following steps:

receiving a command from a remote location, the command informing the set top terminal that reprogramming is to commence;

receiving a reprogramming signal having one or more frames comprising a control portion and a data portion, the reprogramming signal designating the memory locations to be updated in the control portion and providing program changes in the data portion;

reading the program changes from the received reprogramming signal;

storing the read program changes in volatile memory;

instructing the transfer of the stored program changes from the volatile memory to designated memory locations in nonvolatile memory, whereby the stored program changes are transferred; and

resetting the set top terminal so that the set top terminal operates using the transferred program changes.

15. The method of claim 14, further comprising the step of suggesting a television program to a subscriber.

16. The method of claim 14, further comprising the step of running an operation program during the step of instructing, thereby allowing the set top terminal to function as normal during the instructing step.

17. The method of clam 14, wherein an old program n−1 is stored in a memory, and a current program n is stored in the nonvolatile memory, and wherein the step of instructing further comprises the step of:

overwriting the program changes to specified memory locations in the nonvolatile memory to overwrite the old program n−1 without overwriting the current program n.

18. The method of claim 14, wherein the set top terminal uses stored menus, the data portion includes new menu information, and wherein the step of instructing includes the step of updating a stored menu with a new menu based on the new menu information.

19. A set top terminal for suggesting programs to subscribers, wherein the set top terminal uses a program control information signal containing information concerning programs, a reprogramming signal, and subscriber data indicative of subscriber programming preferences, comprising:

one or more receivers wherein the reprogramming signal and the program control information signal are received;

a means, connected to the one or more receivers, for extracting reprogramming data from the received reprogramming signal;

a first memory, connected to the extracting means, for storing the reprogramming data;

a means, connected to the first memory and a second memory, for transferring the stored reprogramming data from the first memory to the second memory;

a selecting means, connected to the second memory and the receivers, for selecting one or more programs for

suggestion based on the received program control information signal and the subscriber data; and

a means, connected to the selecting means, for displaying information concerning the one or more selected programs for suggestion to the subscriber.

20. The set top terminal of claim **19**, wherein the set top terminal operates through the use of executable instructions and wherein the second memory stores the executable instructions.

21. The set top terminal of claim **19**, wherein the second memory comprises a individual memory modules, and wherein the transferring means comprises:

means for forwarding the stored reprogramming data to individual memory modules of the second memory.

22. The set top terminal of claim **19**, further comprising a means, connected to the second memory, for gathering subscriber data.

23. The set top terminal of claim **19**, wherein the received program control information signal contains program abstract data and wherein the set top terminal further comprises:

a third memory, connected to the receivers, for storing the received program abstract data;

wherein the selecting means comprises:

a means for mapping the subscriber data into key words; and

a means for searching the stored program abstract data for the mapped key words, wherein the programs are selected for suggestion using the search.

24. The set top terminal of claim **19**, wherein the received program control information signal contains favorite channel data and wherein

the selecting means comprises means for suggesting one or more programs based on the favorite channel data and the subscriber data.

25. The set top terminal of claim **19**, wherein most watched channel data is used, and wherein

the selecting means comprises means for suggesting one or more programs using the most watched channel data and the subscriber data.

26. The set top terminal of claim **19**, wherein personal profile data is used and wherein

the selecting means comprises means for suggesting one or more programs based on the personal profile data and the subscriber data.

27. The set top terminal of claim **19** wherein the program control information signal includes the reprogramming signal, so that the reprogramming signal is contained within the program control information signal.

28. The set top terminal of claim **19** wherein the subscriber data is stored in the first memory or the second memory.

29. A method of reprogramming a set top terminal for suggesting programs to subscribers, wherein the set top terminal uses a program control information signal containing information concerning programs and reprogramming data, comprising the steps of:

receiving the program control information signal;

extracting reprogramming data from the received program control information signal;

storing the reprogramming data in a first memory;

storing subscriber specific data in a second memory;

transferring the stored reprogramming data from the first memory to the second memory or a third memory;

selecting one or more programs based on the received program control information signal and the stored subscriber specific data;

displaying program information concerning the one or more selected programs for suggestion to the subscriber.

30. The method of claim **29**, further comprising the step of gathering the subscriber specific data to be stored in the second memory.

31. The method of claim **29**, wherein the received program control information signal contains program abstract data, and further comprising the step of storing the received program abstract data in the first, second, or a third memory, and wherein the step of selecting further comprises the steps of:

mapping the subscriber data into key words; and

searching the stored program abstract data for the mapped key words, wherein the programs are selected for suggestion based on the search.

32. The method of claim **29**, further comprising the step of storing favorite channel data in the first, second, or a third memory, and wherein the step of selecting uses the stored favorite channel data and the stored subscriber specific data.

33. The method of claim **29**, comprising the step of storing most watched channel data in the first, second, or a third memory, and wherein the step of selecting uses the stored most watched channel data and the stored subscriber specific data.

34. The method of claim **29**, further comprising the step of storing personal profile data in the first, second, or a third memory, and wherein the step of selecting uses the stored personal profile data and the stored subscriber specific data.

35. The method of claim **29**, further comprising the step of running an operation program during the step of transferring, so that the set top terminal functions during the transferring step.

36. The method of claim **29**, wherein the set top terminal uses menus, and wherein the reprogramming data is menu data to reprogram menus, the step of selecting further comprising the step of generating a menu.

37. The method of claim **29**, wherein the step of transferring further comprises the steps of:

moving the reprogramming data from the first memory to the second memory without overwriting the subscriber specific data stored in the second memory; and

instructing the set top terminal to use the reprogramming data stored in the second memory instead of the subscriber specific data stored in the second memory, thereby updating the subscriber specific data without overwriting previous subscriber specific data.

38. A reprogrammable set top terminal for suggesting programs to subscribers, wherein the set top terminal uses a program control information signal containing information concerning programs, reprogramming data, and previously obtained data, comprising:

a receiver, adapted to receive the reprogramming data and the program control information signal;

a first memory means for storing the received reprogramming data;

a means, connected to the first memory, for instructing the set top terminal to utilize the received reprogramming data instead of the previously obtained data, thereby updating the previously obtained data to produce updated data;

a means for selecting one or more programs for suggestion based on the received program control information signal and the updated data; and

a means, connected to the selecting means, for displaying program information concerning the one or more selected programs.

39. The reprogrammable set top terminal of claim 38, wherein the first memory means is a nonvolatile storage device.

40. The reprogrammable set top terminal of claim 38, wherein the previously obtained data is previously obtained subscriber specific data, further comprising:

a second memory means for storing the previously obtained subscriber specific data;

a storage means, made up of a plurality of memory modules, comprising:
the first memory means; and
the second memory means;

wherein the instructing means comprises:
means for forwarding the stored reprogramming data to individual memory modules of the storage means.

41. The reprogrammable set top terminal of claim 38, further comprising:

a means for gathering subscriber specific data;

a second memory means for storing the gathered subscriber specific data;

wherein the instructing means overwrites the second memory with the reprogramming data.

42. The reprogrammable set top terminal of claim 38, wherein the program control information signal contains program abstract data, the receiver receives the program abstract data, and wherein the set top terminal further comprises:

a second memory means, connected to the receiver, for storing the received program abstract data;

wherein the selecting means comprises:
a means for mapping the subscriber data into key words; and
a means for searching the stored program abstract data for the mapped key words, wherein the programs are selected for suggestion based on the search.

43. The reprogrammable set top terminal of claim 38, using favorite channel data, and wherein the set top terminal further comprises a second memory means for storing the favorite channel data, and wherein the selecting means further comprises means for suggesting one or more programs based on the stored favorite channel data and the updated subscriber specific data.

44. The reprogrammable set top terminal of claim 43, wherein the receiver is connected to the second memory means and obtains the favorite channel data from the program control information signal.

45. The reprogrammable set top terminal of claim 43, wherein the set top terminal further comprises a means, connected to the second memory means, for inputting the favorite channel data.

46. The reprogrammable set top terminal of claim 38, using most watched channel data, and wherein the set top terminal further comprises a second memory means for storing the most watched channel data, and wherein the selecting means further comprises means for suggesting one or more programs based on the stored most watched channel data and the updated data.

47. The reprogrammable set top terminal of claim 46, wherein the receiver is connected to the second memory means and obtains the most watched channel data from the program control information signal.

48. The reprogrammable set top terminal of claim 46, wherein the set top terminal further comprises a means, connected to the second memory, for processing subscriber selections to determine the favorite channel data.

49. The reprogrammable set top terminal of claim 38, using personal profile data, and wherein the set top terminal further comprises a second memory means for storing the personal profile data, and wherein the selecting means further comprises means for suggesting one or more programs based on the stored personal profile data and the updated data.

50. The reprogrammable set top terminal of claim 49, wherein the receiver is connected to the second memory means and obtains the personal profile data from the program control information signal.

51. The reprogrammable set top terminal of claim 49, wherein the set top terminal further comprises a means, connected to the second memory means, for processing subscriber selections to determine the personal profile data.

52. The reprogrammable set top terminal of claim 49, wherein the set top terminal further comprises a means, connected to the second memory, for inputting the personal profile data.

53. The reprogrammable set top terminal of claim 38, wherein the set top uses menus, and wherein the reprogramming data is menu data to update the menus.

54. The reprogrammable set top terminal of claim 53, wherein the menus contain graphics, and wherein the menu data comprises graphical data to update the menu graphics.

55. The reprogrammable set top terminal of claim 53, wherein the menus contain graphics and text, and wherein the menu data comprises graphical data and textual data to update the menu graphics and text.

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